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THREE PORT VERSUS FOUR PORT LAPAROSCOPIC CHOLECYSTECTOMY: A PROSPECTIVE COMPARATIVE CLINICAL STUDY

BY

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As I move forward, I aspire to become a skilled surgeon with a deep understanding of my field, a commitment to continuous learning, and a dedication to providing excellent patient care. I humbly seek God's guidance and assistance as I embark on this noble endeavour.

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DR. JASH DIVYESHBHAI JAGANI

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Abbreviations:

1. **LC** – Laparoscopic Cholecystectomy
2. **3P-LC** – Three-Port Laparoscopic Cholecystectomy
3. **4P-LC** – Four-Port Laparoscopic Cholecystectomy
4. **OT** – Operative Time
5. **IOC** – Intra-Operative Complications
6. **NFP** – Need for Fourth Port
7. **CR** – Conversion Rate
8. **L-O LC** – Laparoscopic to Open Cholecystectomy
9. **PPS** – Postoperative Pain Score
10. **PAR** – Post-Operative Analgesic Requirement
11. **COS** – Cosmesis
12. **SAF** – Safety of the Procedure
13. **DIAB** – Diabetes
14. **HTN** – Hypertension
15. **GA** – General Anesthesia

INTRODUCTION

Cholelithiasis, commonly known as gallstone disease, stands as a significant healthcare concern both in India and worldwide. Cholecystectomy, the surgical removal of the gallbladder, remains the cornerstone of treatment for this condition. In Western societies, the prevalence of cholelithiasis reaches up to 10-15% of the population, [1] with a vast majority of cases being asymptomatic, exceeding 80%. However, in India, the estimated prevalence is lower, around 4%. The historical trajectory of cholecystectomy showcases a remarkable evolution in surgical techniques. The first documented cholecystectomy was performed in 1882 by Carl Langebuch in Germany, marking a pivotal moment in surgical history. Subsequently, the advent of laparoscopic cholecystectomy in 1985 by Erich Mühe revolutionized gallstone treatment, offering patients a less invasive alternative to traditional open surgery. The endorsement of laparoscopic cholecystectomy as equivalent to open cholecystectomy by the National Institute of Health (NIH) consensus development conference in 1992 solidified its status as the gold standard for treating symptomatic cholelithiasis. This recognition paved the way for widespread adoption of minimally invasive techniques, ushering in an era of reduced surgical trauma, shorter hospital stays, and quicker recovery times for patients. [2] The advantages of laparoscopic cholecystectomy over open procedures are multifaceted. By employing smaller incisions and utilizing specialized instruments, surgeons can minimize tissue damage, leading to reduced postoperative pain and faster recovery. Moreover, patients undergoing

laparoscopic surgery experience earlier oral acceptance of food, enhanced mobility, and improved cosmetic outcomes, factors that contribute to overall patient satisfaction. the standard four-port technique for laparoscopic cholecystectomy has undergone refinement, with surgeons exploring variations to further optimize patient outcomes. From the adoption of three-port and two-port techniques to the emergence of single-port approaches, these innovations underscore a continuous quest for surgical excellence and patient-centered care. [3] The transition towards fewer port incisions not only streamlines the surgical process but also offers tangible benefits for patients. Reduced postoperative pain and analgesic requirements, coupled with improved cosmetic results, highlight the tangible advantages of these evolving techniques. Furthermore, the comparable operative times between traditional and modified approaches underscore the feasibility and efficacy of these advancements in clinical practice. the journey of cholecystectomy from its inception to the present day exemplifies the remarkable progress in surgical innovation and patient care. As we continue to refine techniques and embrace advancements, the future holds promise for further enhancing outcomes and improving the quality of life for individuals affected by cholelithiasis. [4] Laparoscopic cholecystectomy has emerged as the preferred surgical intervention for managing symptomatic gallstone disease due to its minimally invasive nature and associated benefits such as reduced postoperative pain and faster recovery times. However, despite its widespread adoption and success, there are instances where performing laparoscopic

cholecystectomy proves challenging. One of the challenges encountered with laparoscopic cholecystectomy is the variability in surgical difficulty. While it is generally considered a relatively straightforward procedure, there are cases where it may present unexpected complexities. Factors such as the size and location of gallstones, the presence of inflammation or scarring, and anatomical variations can contribute to the difficulty of the surgery. In some instances, laparoscopic cholecystectomy may take longer than anticipated, [5] requiring meticulous dissection and careful maneuvering to safely remove the gallbladder. Additionally, there are situations where intraoperative complications arise, necessitating the conversion to an open cholecystectomy for the safety of the patient. One of the inherent challenges in laparoscopic cholecystectomy is the difficulty in accurately predicting the level of complexity preoperatively. While imaging studies and clinical assessments can provide valuable information, they may not always accurately reflect the intraoperative challenges that may be encountered. Despite these challenges, laparoscopic cholecystectomy remains the gold standard for the surgical treatment of gallbladder disease. Its benefits in terms of reduced postoperative pain, shorter hospital stays, and faster recovery times far outweigh the potential challenges associated with the procedure. while laparoscopic cholecystectomy has revolutionized the management of gallstone disease, it is important for surgeons to remain vigilant and prepared for potential challenges that may arise during the procedure. By recognizing the variability in

surgical difficulty and being adept at managing unexpected complications, surgeons can ensure the safety and success of this commonly performed surgery.[6] Laparoscopic cholecystectomy offers numerous advantages, but like any surgical procedure, it is not without its share of complications. Some of these complications are specific to the unique techniques employed in laparoscopic surgery, while others are common to the broader spectrum of minimally invasive procedures. One notable complication of laparoscopic cholecystectomy is the need for conversion to open surgery in a subset of patients. Studies have reported that approximately 2% to 15% of patients undergoing laparoscopic cholecystectomy may require conversion to an open technique for various reasons. This conversion can be necessitated by factors such as difficult anatomy, extensive adhesions, or unforeseen intraoperative complications. The decision to convert to open surgery has implications beyond the immediate surgical context. It can result in increased operative time, heightened costs, and potentially greater morbidity for the patient. Therefore, efforts to minimize the need for conversion are of paramount importance in optimizing patient outcomes. [7]

Recognizing the significance of predicting the likelihood of conversion, J.S. Randhawa and A.K. Pujahari, from the department of general surgery at the Indian Air Force Hospital in Bangalore, devised a scoring system aimed at preoperatively assessing the risk of difficult laparoscopic cholecystectomy. In the context of their study, the researchers sought to evaluate the efficacy of the Randhawa and Pujahari scoring system in predicting the likelihood of conversion

from laparoscopic to open cholecystectomy. By identifying preoperative factors that correlate with increased difficulty in performing the procedure laparoscopically, this scoring system has the potential to guide clinical decision-making and optimize patient selection for laparoscopic cholecystectomy. [8] Through systematic assessment and validation of predictive factors, clinicians can better anticipate and mitigate the challenges associated with laparoscopic cholecystectomy, ultimately improving patient outcomes and reducing the need for conversion to open surgery. In 1994, I personally encountered a troubling scenario involving two patients with gallstone disease who later developed port site metastases from gallbladder cancer (GBC) following laparoscopic cholecystectomy. The discovery of malignant specimens in these cases was unexpected, as is often the case with gallbladder cancer, leading to the initial planning of laparoscopic cholecystectomy. It is noteworthy that approximately 0.5-2.0% of all cholecystectomy patients may incidentally harbor gallbladder cancer, necessitating careful consideration of surgical approaches. The emergence of port site metastases in these patients prompted a comprehensive investigation into the incidence of metastatic spread from gallbladder cancer to the wound sites created by laparoscopic working ports. [9] Concurrently, we embarked on a study to evaluate the occurrence of wound metastases following open cholecystectomy. This dual-pronged approach aimed to shed light on the potential risks associated with laparoscopic techniques in the context of malignancy. Our research endeavors also encompassed experimental

investigations to explore any features associated with the laparoscopic technique that might contribute to the increased growth of malignant cells during laparoscopic surgery. By systematically examining factors such as surgical instrumentation, tissue handling, and intraoperative conditions, we sought to elucidate potential mechanisms underlying the observed phenomenon of port site metastases in gallbladder cancer patients undergoing laparoscopic cholecystectomy. The findings from our investigations hold significant implications for the practice of minimally invasive surgery, particularly in cases involving suspected or incidental malignancy. As laparoscopic cholecystectomy continues to be the standard treatment for gallstone disease, it is imperative to gain a deeper understanding of the risks and limitations associated with this approach, particularly in the context of occult malignancy. Through ongoing research and clinical vigilance, we aim to optimize patient outcomes and minimize the potential for adverse events in the management of gallbladder disease. The origins of endoscopic examinations can be traced back to ancient times, with the Kos school led by Hippocrates (460-375 BC) making notable contributions. Hippocrates described a rectal speculum, remarkably similar to modern versions, showcasing an early understanding of the utility of endoscopic techniques. similar speculums for inspecting the vagina, nose, and ear were unearthed in the ruins of Pompeii, underscoring the widespread use of such instruments in antiquity. In the 16th century, advancements in endoscopy took a significant leap forward with the introduction of illumination by Girolamo Aranzi.

Aranzi ingeniously focused sunlight through a flask of water, projecting it into the nasal cavity for examination. This innovation laid the foundation for subsequent developments in endoscopic visualization. Philip Bozzini, an obstetrician from Frankfurt, [10] made further strides in endoscopic technology in 1805 with the creation of the "Lichtleiter," an aluminum tube equipped with mirrors to reflect images illuminated by a wax candle. This early endoscope enabled the visualization of various body cavities, albeit with limited illumination and resolution. Building upon Bozzini's work, Antoine Jean Desormeaux, a French urologist, refined the Lichtleiter by replacing the candle with a brighter-burning mixture of alcohol and turpentine. Desormeaux's improvements facilitated more widespread use of the rectoscope in clinical practice, earning him the moniker "father of endoscopy." His seminal monograph from 1865, "De l`endoscopie," not only documented his advancements but also spurred American instrument makers to embark on the production of endoscopes. The 19th century witnessed a pivotal shift in endoscopic exploration towards the upper gastrointestinal tract.

RATIONALE OF THE STUDY

The rationale behind the study titled "Three Ports versus Four Port Laparoscopic Cholecystectomy: A Prospective Comparative Clinical Study" stems from the ongoing quest for refining surgical techniques to optimize patient outcomes. Laparoscopic cholecystectomy has become the standard of care for gallstone disease due to its minimally invasive nature and associated benefits. However, the optimal number of ports required for this procedure remains a subject of debate. While the traditional four-port technique has been widely employed, recent advancements have led to the exploration of modified approaches, such as three-port laparoscopic cholecystectomy. [11] The rationale for this study lies in the need to systematically compare the efficacy, safety, and feasibility of the three-port technique against the conventional four-port method. By prospectively evaluating clinical outcomes, including operative time, postoperative pain, complication rates, and cosmesis, this study aims to provide valuable insights into the relative merits of each approach. Ultimately, the findings from this comparative analysis can inform clinical practice and guide surgeons in selecting the most optimal surgical technique for laparoscopic cholecystectomy, thereby enhancing patient care and surgical outcomes.

AIMS AND OBJECTIVE

The aims and objectives of this study are as follows:

AIM: - To Compare the outcomes in three port vs four port laparoscopic cholecystectomy.

OBJECTIVE: - To Evaluate outcome using below mention parameters.

- Operative time,
- Intra-operative complications,
- Need for fourth port,
- Conversion rate (laparoscopic to open cholecystectomy)
- Postoperative Pain score,
- Post-operative analgesic requirement
- Cosmesis

REVIEW OF LITERATURE

The history of cholecystectomy, the surgical removal of the gallbladder, encapsulates a fascinating journey through time, reflecting the relentless evolution of medical science and surgical techniques. Initially, the concept of removing the gallbladder as a treatment for gallstone disease was met with skepticism, with the procedure not gaining widespread acceptance until the turn of the 20th century. It was Carl Langenbuch [12] in Berlin who performed the first documented open cholecystectomy in 1882. His patient, a 42-year-old man suffering from persistent biliary colic, underwent this pioneering surgery, marking the beginning of a transformative era in surgical practice. It wasn't until the latter half of the 20th century that a truly revolutionary advancement occurred with the advent of laparoscopic cholecystectomy (LC). The first laparoscopic cholecystectomies were performed independently by Eric Muhe in Germany in 1985 and Philippe Mouret in France in 1987. These groundbreaking procedures ushered in a new era of surgical innovation, offering patients a minimally invasive alternative to traditional open surgery.

The introduction of LC presented numerous advantages over open cholecystectomy, foremost among them being improved postoperative recovery and reduced pain. Patients undergoing LC experienced shorter hospital stays and faster return to normal activities, leading to a significant enhancement in their quality of life. As the benefits of laparoscopic surgery became increasingly apparent, its adoption soared, with 10% of cholecystectomies in the United States

being performed laparoscopically by 1990, [13] a figure that skyrocketed to 90.5% by 2010. Despite the remarkable success of laparoscopic cholecystectomy, open cholecystectomy continues to play a role in contemporary surgical practice. Certain scenarios, such as complex anatomical variations or severe gallbladder disease, may necessitate an open approach. Moreover, open cholecystectomy remains an essential component of more extensive surgeries involving the liver, bile ducts, or pancreas. In instances where laparoscopic dissection proves challenging or unsuccessful, conversion to an open procedure may be warranted to ensure the safety and efficacy of the operation. Surgeons, therefore, must maintain proficiency in both laparoscopic and open techniques, adapting their approach to suit the unique needs of each patient and clinical scenario. The evolution of cholecystectomy from its humble beginnings as an open procedure to the widespread adoption of laparoscopic techniques represents a triumph of medical progress. While laparoscopic cholecystectomy has undoubtedly revolutionized the field of surgery, the continued relevance of open cholecystectomy underscores the importance of versatility and adaptability in surgical practice. As we look towards the future, the quest for further advancements in surgical techniques and patient care remains paramount. [14]

EMBRYOLOGY: The development of the biliary tree, gallbladder, and ventral pancreas during embryogenesis is a fascinating process that unfolds over several weeks, shaping the intricate anatomy of these vital organs. It all begins early in the fourth week of intrauterine life when a hepatic diverticulum emerges in the

ventral wall of the primitive midgut. This tiny diverticulum serves as the foundation for the subsequent development of the liver, extrahepatic biliary ducts, gallbladder, and ventral pancreas. Remarkably, by the fifth week, all components of the biliary tree become discernible, marking a significant milestone in embryonic development. During this period, there is notable elongation of the common duct, accompanied by the occlusion of its lumen by epithelial cells. Recanalization of the common duct's lumen commences towards the end of the fifth week, progressing gradually towards its distal end. By the sixth week, a pivotal rotation occurs as the common duct and ventral pancreatic bud undergo a 180-degree clockwise rotation around the duodenum, further shaping their anatomical relationships. Continuing into the seventh week, the bile and pancreatic ducts terminate in closed cavities within the duodenum, setting the stage for their functional integration with the digestive system. Between the eighth and twelfth weeks, the hepatopancreatic ducts exhibit both superior and inferior orifices, with the latter typically being suppressed during development.[15]

The formation of the sphincter of Oddi, a critical muscular structure regulating the flow of bile and pancreatic juices, begins around the tenth week. Initially, it arises from a concentric ring of mesenchyme surrounding the preampullary portion of the bile and pancreatic ducts. As development progresses, the sphincter undergoes differentiation and matures, culminating in the formation of a functional barrier by the sixteenth week. By the twenty-eighth week, significant

progress is observed as the muscularis propria, the muscle layer responsible for the motility of the biliary and pancreatic ducts, undergoes extensive differentiation. This process continues until almost the entire length of the ampulla is encompassed by the well-developed muscularis propria. the intricate developmental journey of the biliary tree, gallbladder, and ventral pancreas underscores the complexity and precision of embryonic morphogenesis, laying the foundation for their crucial roles in digestion and metabolic regulation postnatally. [16]

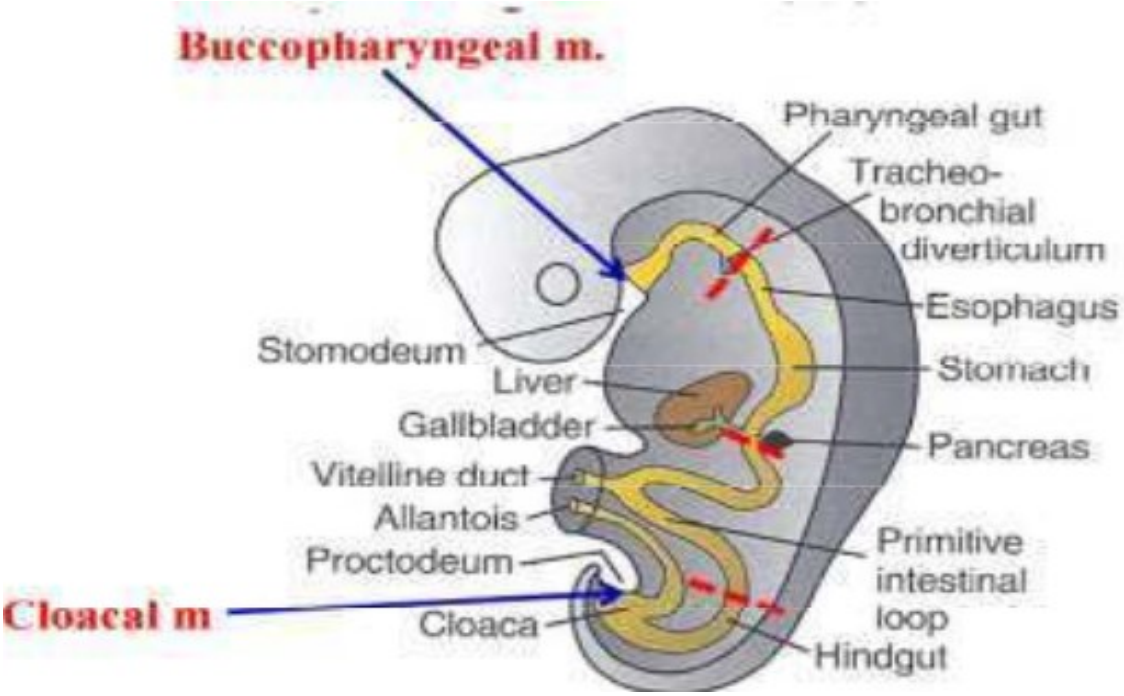
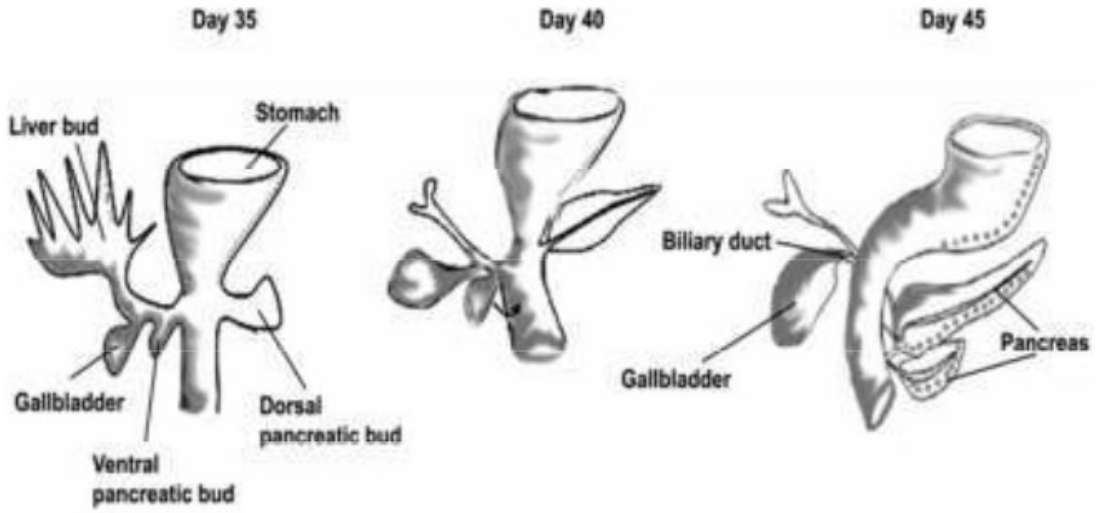


FIG.1 EMBRYOLOGY OF GALL BLADDER



SURGICAL ANATOMY [17]

GALLBLADDER: The gallbladder, a vital component of the biliary system, occupies a partially intraperitoneal position, nestled beneath the undersurface of the liver primarily on segments IVB and V. Its dimensions typically range from 7 to 10 cm in length, providing a reservoir capable of holding 30 to 60 mL of bile. Structurally, the gallbladder comprises distinct regions, including the neck, infundibulum with Hartmann pouch, body, and fundus, delineating its functional zones and anatomical features. the aspect of the gallbladder that interfaces with the liver lacks a peritoneal covering; instead, it is covered by a fibrous lining termed the cystic plate. This arrangement facilitates the intimate attachment of the gallbladder to the liver, ensuring stability and structural integrity. Bile synthesized by the liver is directed into the gallbladder via the cystic duct, which

serves as the conduit for bile transport. The length of the cystic duct can vary significantly, ranging from 1 to 5 cm, and it typically joins the common bile duct (CBD) at an acute angle. The insertion point of the cystic duct into the CBD exhibits considerable variability, with some instances involving insertion into the right hepatic duct, reflecting the complex and diverse anatomical configurations encountered in clinical practice. Within the neck of the gallbladder, specialized structures known as the valves of Heister play a crucial role in bile retention. These valves consist of mucosal folds arranged in a spiral pattern, effectively trapping bile within the gallbladder until contraction is triggered in response to enteric stimulation. the gallbladder's anatomical organization and functional adaptations highlight its essential role in bile storage and regulation within the biliary system. Understanding the intricacies of gallbladder anatomy is fundamental for clinical practice, guiding diagnostic and therapeutic interventions aimed at managing various biliary disorders and maintaining optimal digestive function. [18]

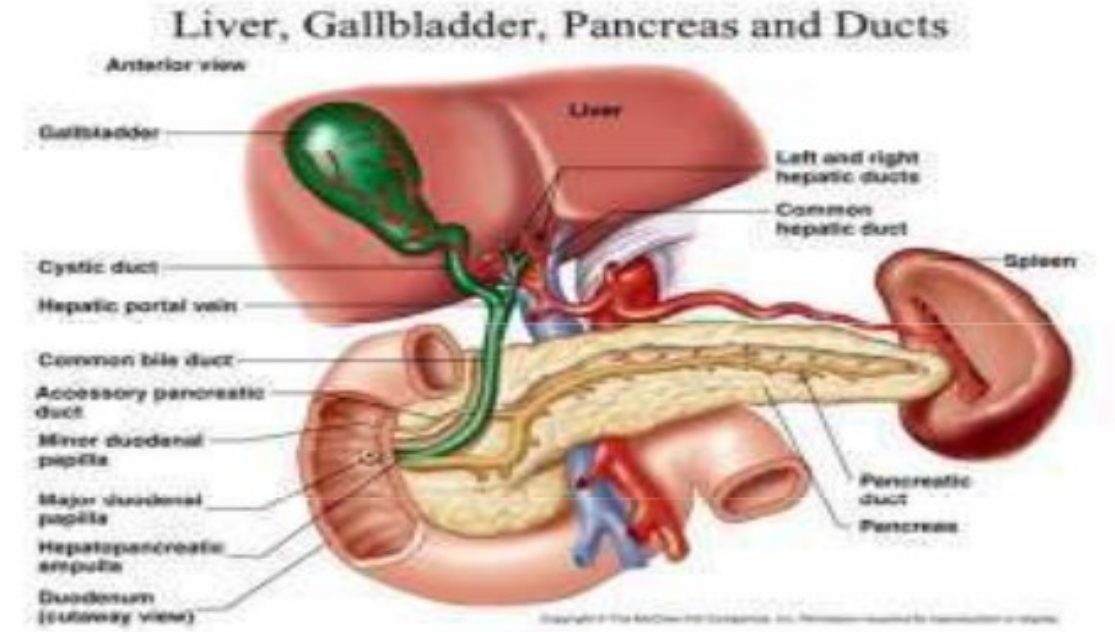


FIG.2 GALL BLADDER ANATOMY

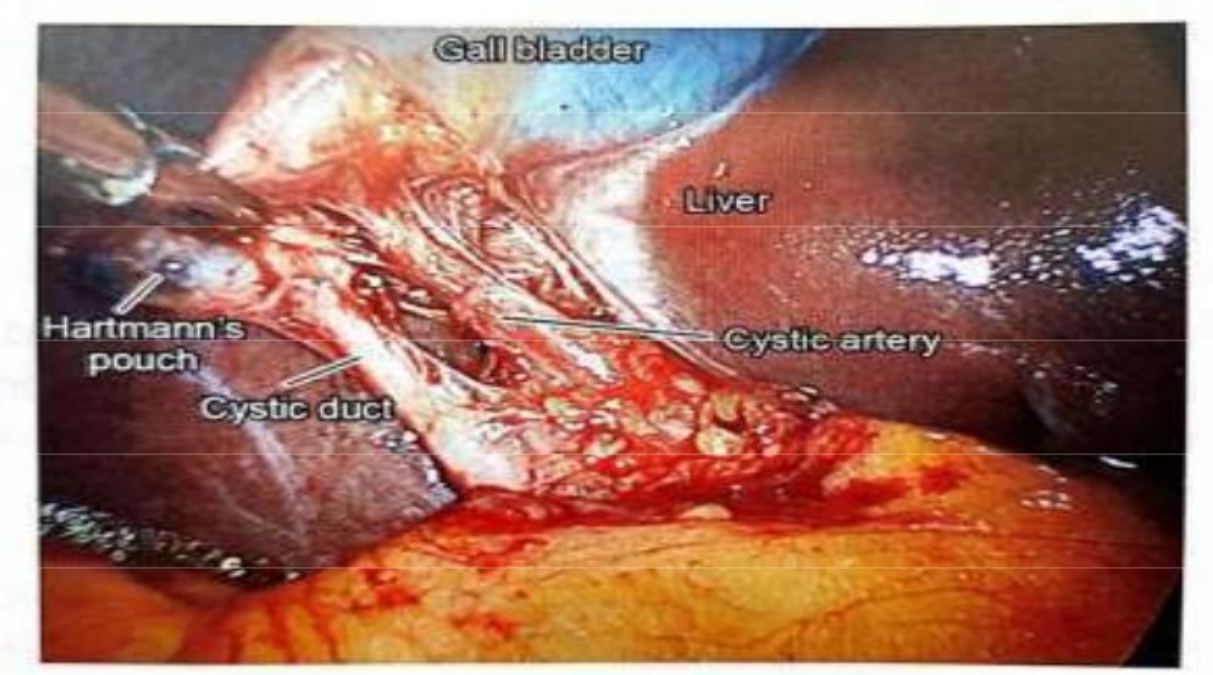


FIG.3 CYSTIC DUCT AND CYSTIC ARTERY IN CALOT'S TRIANGLE

FIG.4 CALOT'S TRIANGLE IN OPEN CHOLECYSTECTOMY

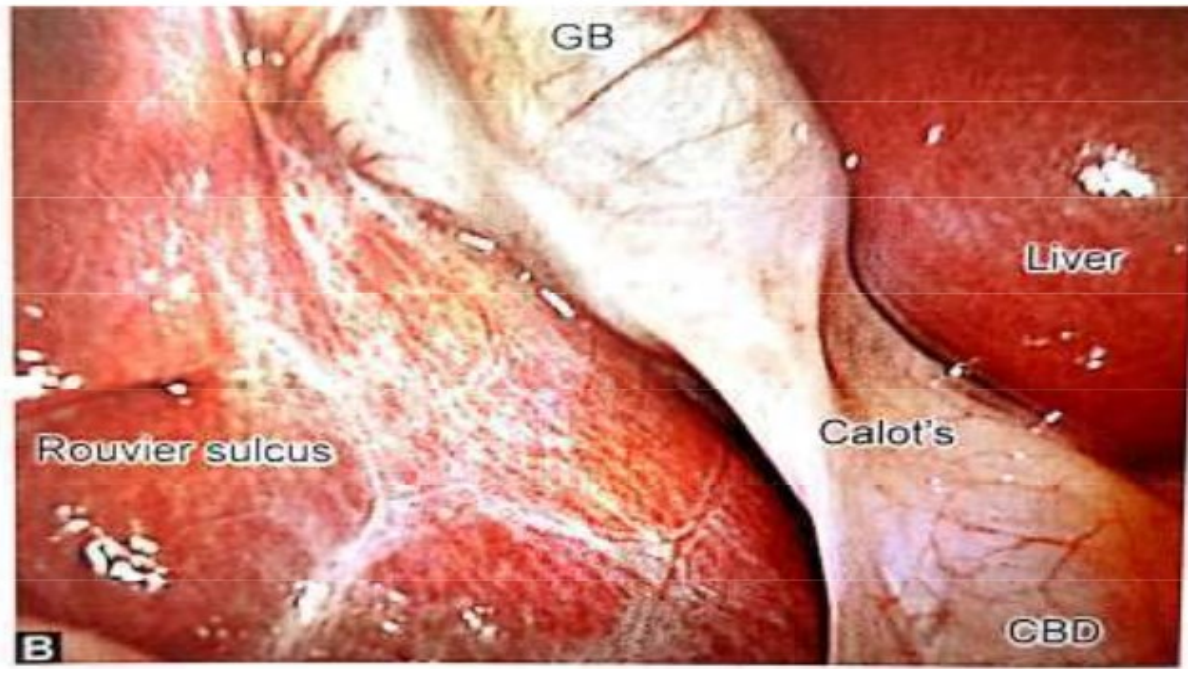


FIG.5 CALOTS TRIANGLE IN LAPAROSCOPIC CHOLECYSTECTOMY

The gallbladder, a crucial component of the biliary system, consists of several distinct anatomical regions, namely the fundus, body, infundibulum, and neck.

Hartmann's pouch, a pathological entity, can develop within the infundibular region due to the presence of gallstones, potentially leading to complications. Bile stored in the gallbladder is discharged into the common hepatic duct via the cystic duct, contributing to the formation of the common bile duct. The cystic duct, approximately 3 cm in length with a lumen diameter ranging from 1 to 3 mm, is enveloped by the sphincter of Lutkens and contains spiral valves of Heister, which aid in bile retention. The gallbladder receives its vascular supply from the cystic artery, a branch originating from the right hepatic artery. The anatomical region known as Calot's triangle, named after J R Calot from France [19] in 1891, is delineated by the common hepatic duct to the left, the cystic duct below, and the inferior surface of the liver or cystic artery above. Within this triangular space, the cystic artery, arising from the right hepatic artery, courses behind the common hepatic duct before entering Calot's triangle to reach the gallbladder. Additionally, Calot's triangle contains the lymph node of 'Lund,' also known as Mascagni's node. Anomalies in the positions and origins of the cystic artery, hepatic artery, and cystic duct are not uncommon, highlighting the variability and complexity of biliary anatomy. Clinicians must be vigilant to such variations when planning and performing surgical procedures involving the gallbladder and biliary tract to ensure optimal patient outcomes and minimize complications. [20]

VASCULAR ANATOMY: The blood supply to the biliary tree presents a unique vascular arrangement, primarily reliant on arterial circulation, in stark contrast to the hepatic parenchyma, which benefits from dual perfusion

originating from both the arterial and portal venous systems. This arterial dominance renders the biliary tree particularly vulnerable to ischemic injury, as it lacks the protective buffer provided by portal venous flow. The cystic artery, responsible for supplying blood to the gallbladder, typically arises from the right hepatic artery. However, its origin displays considerable variability, with potential sources including the right hepatic, left hepatic, proper hepatic, common hepatic, gastroduodenal, or superior mesenteric artery. This variability underscores the complexity of biliary vascular anatomy and highlights the need for meticulous attention to detail during surgical interventions involving the gallbladder. the course of the cystic artery may vary, with possible trajectories either posterior or anterior to the common bile duct (CBD) as it traverses to reach the gallbladder.[21] Despite this variability, the cystic artery typically lies superior to the cystic duct and is often associated with a lymph node known as the Calot node. Enlargement of the Calot node can occur in the setting of gallbladder pathology, whether inflammatory or neoplastic, reflecting its role as a primary site for lymphatic drainage from the gallbladder. the intricate vascular supply to the biliary tree, predominantly arterial in nature, underscores the potential for vascular variations and the importance of precise anatomical knowledge in clinical practice. Understanding these nuances is essential for mitigating risks during surgical procedures involving the biliary system and ensuring optimal patient outcomes.

GALLSTONES: 1. Cholesterol stones, comprising only about 6% of all gallstones, typically manifest as solitary formations within the gallbladder. These stones primarily consist of cholesterol and may vary in size and shape.

2. Mixed stones represent the most prevalent type, constituting approximately 90% of all gallstones. These stones are characterized by their diverse composition, encompassing not only cholesterol but also calcium salts of phosphate and carbonate, palmitate, proteins, and other components. Their appearance is typically multifaceted and they often occur in clusters. [22]

3. Pigment stones, which are smaller in size and exhibit a black or greenish-black hue, are frequently encountered in clinical practice. These stones tend to be multiple and can sometimes resemble sludge in consistency. They are particularly prevalent in individuals who fit the mnemonic "Fat, Fertile, Forty, Flatulent, Female," highlighting certain demographic predispositions to their formation.

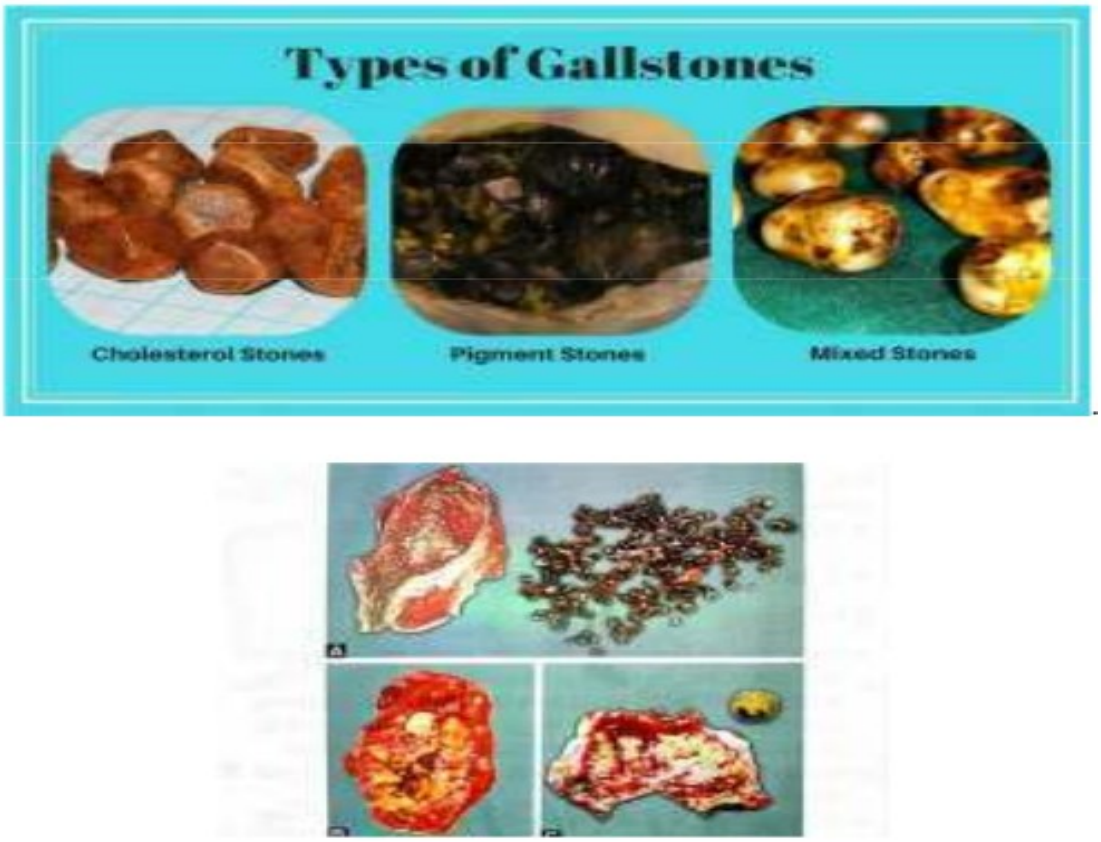


FIG.6 TYPES OF GALLSTONES

CLINICAL PRESENTATION OF GALLSTONES: [23] Gallstones are frequently discovered unexpectedly during abdominal imaging procedures, as they often do not cause symptoms. However, when they do, it's typically due to an obstruction in the flow of bile from the gallbladder, commonly occurring when the cystic duct becomes blocked. This obstruction leads to biliary colic, a condition characterized by intermittent episodes of severe pain, often occurring after meals when the gallbladder contracts in response to the release of cholecystokinin. The pain associated with biliary colic typically manifests in the right upper quadrant or epigastric region and may radiate to the back. It's often described as colicky and can be accompanied by nausea, vomiting, dyspepsia,

flatulence, and an intolerance to fatty foods. [24] In cases where the obstruction affects the common bile duct, patients may also present with jaundice, characterized by yellowing of the skin and eyes due to the buildup of bilirubin in the bloodstream. In rare instances, gallstones can lead to a condition known as gallstone ileus, where a large stone obstructs the bowel, causing symptoms of bowel obstruction. Chronic cholecystitis, a persistent inflammation of the gallbladder, can result in ongoing pain and thickening of the gallbladder wall. This can make surgical removal of the gallbladder more challenging, especially in cases where there has been repeated inflammation and scarring. As individuals age, the likelihood of experiencing multiple episodes of cholecystitis increases, along with a higher frequency of previous abdominal surgeries. This can lead to increased fibrosis and adhesions around the gallbladder, complicating surgical intervention and potentially increasing the risk of complications. [25] The prevalence of gallstones is significantly higher in females compared to males, a phenomenon largely attributed to the influence of female sex hormones, particularly estrogen and progesterone. These hormones can alter the composition of bile and impair gallbladder function, increasing the risk of stone formation. obesity, characterized by a high body mass index (BMI), is a significant risk factor for gallstone formation. Obesity can lead to fatty liver disease and the development of adhesions in the area around the gallbladder, making surgical removal more challenging. gallstone disease is a complex condition influenced by various factors, including age, gender, and BMI. Understanding these factors

and their implications for management is crucial for providing effective treatment and minimizing the risk of complications.

Biochemical parameters- Assessing biochemical parameters is vital in predicting the complexity of laparoscopic cholecystectomy (LC) before surgery. Raised total leukocyte count (TLC) and abnormalities in liver function tests (LFT) have emerged as significant indicators of potential challenges during LC. These findings often suggest persistent acute inflammation and edema within the gallbladder, making surgical dissection more arduous. [26] Patients with elevated TLC, particularly in cases of acute cholecystitis, are more likely to present with complex gallbladder conditions, adding further complexity to the surgical procedure. Moreover, abnormal LFT and increased amylase levels may signal ongoing hepatitis, cholangitis, or pancreatitis, exacerbating edema and complicating dissection during surgery. [27]

Transabdominal ultrasound serves as a primary diagnostic tool due to its sensitivity, reliability, and cost-effectiveness in assessing hepatobiliary conditions. This imaging modality provides valuable insights into various aspects of the biliary system, including the presence of calculi, gallbladder dimensions, wall thickness, pericholecystic collections, and the morphology of the biliary tree. Additionally, it can occasionally detect the presence of choledocholithiasis. Gallstones typically manifest as echogenic structures with posterior acoustic shadowing on ultrasound, aiding in their identification. Mobile gallstones can be distinguished from fixed polyps or sludge by their ability to change position with

patient movement. Color Doppler ultrasound is particularly useful for detecting twinkling artifacts, which help identify small stones. In grayscale ultrasound, the visualization of posterior acoustic shadowing is enhanced when stone size exceeds 3 mm, especially with higher transducer frequencies. Interestingly, a gallbladder filled with stones may present a challenge in visualization, a phenomenon referred to as the wall echo sign. Despite its advantages, transabdominal ultrasound is subject to operator dependency and may encounter limitations in cases with significant bowel gas interference. Nevertheless, it remains an invaluable tool in the initial assessment of hepatobiliary pathology, guiding clinical decision-making and treatment planning. [28]

EFFECTS AND COMPLICATIONS:

- Biliary colic
- Acute and chronic cholecystitis
- Gallbladder empyema, mucocele
- Gallbladder perforation
- Common bile duct obstruction,
- Acute cholangitis
- Acute pancreatitis
- Intestinal obstruction due to gallstone ileus,
- Cholecysto duodenal fistula
- Gallbladder malignancy

- Mirizzi syndrome due compression of CBD by stone in cystic duct

DIAGNOSIS:

Blood investigations- play a crucial role in evaluating patients with symptomatic gallstones. Elevated serum transaminases are observed in nearly 50% of patients, indicating liver inflammation or injury secondary to gallstone-related complications. Acute cases may present with an increased white blood cell count, reflecting an inflammatory response. Serum lipase and amylase levels are particularly useful in suspected cases of gallstone pancreatitis, aiding in diagnosis and management. [29] Severe jaundice resulting from liver dysfunction may lead to abnormal prothrombin time (PT) and activated partial thromboplastin time (aPTT), indicating impaired coagulation function. Plain X-ray abdomen serves as a preliminary diagnostic tool, although only approximately 10% of gallstones are radio-opaque and visible on X-ray. However, a porcelain gallbladder, characterized by extensive calcification of the gallbladder wall, can be visualized on plain X-ray films. The presence of a porcelain gallbladder is considered an indication for urgent cholecystectomy due to its association with a higher risk of malignancy. Cholangiography, either preoperatively or intraoperatively, is invaluable for assessing the anatomy of the biliary system and minimizing the risk of common bile duct (CBD) injury during cholecystectomy. Preoperative cholangiography aids in identifying ductal anatomy variations and ensures adequate preoperative planning. Intraoperative cholangiography facilitates the

delineation of the relationship between the cystic and common bile ducts, particularly in cases where anatomical landmarks are obscured or unclear. This aids in safe dissection and reduces the risk of inadvertent injury to vital structures.

Ultrasonography: serves as the primary imaging modality in suspected cases involving the biliary tree, offering several advantages. Its non-invasive nature, absence of radiation exposure, and feasibility in critically ill patients make it an indispensable tool in clinical practice. Ultrasonography is capable of detecting gallstones larger than 1 mm in diameter, allowing for early diagnosis and intervention. Furthermore, it can rule out alternative etiologies of right hypochondrium pain, such as abscesses and malignancies, providing valuable diagnostic clarity. In cases of choledocholithiasis, [30] ultrasonography can identify dilatation of the common bile duct (CBD) diameter, aiding in the diagnosis and management of this condition. Gallstones appear as movable echogenic spots with posterior acoustic shadowing on ultrasound due to their acoustically dense nature. Additionally, ultrasonography can detect gallbladder sludge, characterized by tiny echogenic spots, which do not produce shadows. This capability enhances diagnostic accuracy and allows for timely intervention. Despite its numerous advantages, ultrasonography is operator-dependent, meaning the quality and interpretation of images may vary depending on the skill and experience of the operator. with proper training and expertise, ultrasonography remains a valuable and widely used imaging modality in the evaluation of biliary pathologies.

Computed Tomography (CT): imaging is not typically the initial diagnostic test for evaluating biliary pathologies due to its lower sensitivity compared to ultrasonography. Routine CT scans may often miss gallstones, making it less effective as a primary screening tool for gallstone-related conditions. However, CT imaging plays a crucial role in providing detailed information regarding the nature, extent, and anatomical relationships of the biliary tree and surrounding structures. In cases where there is suspicion of extrahepatic obstruction or when alternative causes beyond choledocholithiasis are considered, CT imaging may offer advantages over ultrasound. It can help elucidate the underlying pathology and provide a comprehensive assessment of the affected area. CT scans are particularly useful in identifying conditions such as tumors, abscesses, or other inflammatory processes that may be causing biliary obstruction. Despite its utility, CT scanning has limitations and disadvantages. These include ionizing radiation exposure, which poses potential risks, particularly with repeated or high-dose scans. Additionally, CT imaging tends to be more costly compared to ultrasound, making it less accessible in some healthcare settings. However, when indicated, CT imaging remains an invaluable tool in the diagnostic armamentarium for evaluating biliary disorders, providing crucial information for clinical decision-making and treatment planning. [31]

Magnetic Resonance Cholangio Pancreatography (MRCP): Magnetic Resonance Cholangiopancreatography (MRCP) has emerged as a valuable alternative to Endoscopic Retrograde Cholangiography (ERCP) for evaluating

biliary and pancreatic disorders. MRCP offers several advantages, including its non-invasive nature and lack of ionizing radiation exposure, making it a safer option for patients. However, unlike ERCP, MRCP does not have therapeutic capabilities and is primarily used for diagnostic purposes. One of the key features of MRCP is its ability to visualize the biliary tree using native high signal intensity of fluid on T2-weighted images. This allows for detailed imaging of the biliary system without the need for contrast agents or invasive procedures. The sensitivity of MRCP for detecting gallstones and common bile duct (CBD) stones is reported to be over 90%, making it highly reliable for identifying these conditions. MRCP has become an essential tool in the diagnosis and management of biliary and pancreatic disorders, offering high sensitivity and specificity without the associated risks of invasive procedures such as ERCP. While it may not be suitable for therapeutic interventions, its role in providing detailed anatomical information and guiding clinical decision-making is invaluable in modern medical practice.

Endoscopic Retrograde Cholangio Pancreatography (ERCP): Here a side-viewing endoscope is used, by fluoroscopy the common bile duct can be cannulated and a cholangiogram perform. The procedure is done under i.v sedation for the patient. The advantages of ERCP is that you can directly view the ampullary region and have direct access to the CBD. It also has a therapeutic role. It is particularly useful for distal CBD stones specially when it is associated with cholangitis or obstructive jaundice or gallstone pancreatitis. Over here it is

the procedure of choice. Once the distal cbd stone is visualized, sphinterotomy is done and extraction of the stone with dormia basket is done.

Hepatobiliary Scintigraphy: HIDA scan is the most sensitive and specific test for acute cholecystitis – calculus and acalculous. It helps in rapid assessment of gallbladder function. [32]

HIDA - hydoxyiminodiacetic acid is a short lived technetium – 99m bound to immunodiacetic acids which are excreted into the bile duct.The tracers are detected by the gamma rays they radiate. On detection of these rays an image is produce. Failure to detect these rays suggest obstruction at the neck of the gallbladder as in acute cholecystitis. HIDA scan is also useful in the diagnosis of biliary dyskinesia. HIDA scan is not useful in providing anatomical details of the biliary tree.

OPERATIVE MANAGEMENT: Cholecystectomy, the surgical removal of the gallbladder, can be performed through either open or laparoscopic techniques, with both approaches sharing similar indications. These encompass a spectrum of conditions related to gallstones and gallbladder inflammation, including symptomatic gallstones such as mucocele of the gallbladder, recurrent biliary pain, and complications like gallstone-induced pancreatitis or choledocholithiasis. Cholecystitis in its various forms, ranging from acute calculous and acalculous cholecystitis to chronic and gangrenous presentations, also warrants surgical intervention.

Ultrasound image showing posterior acoustic shadow

Asymptomatic cholelithiasis may prompt cholecystectomy in specific cases, such as diabetic patients or those undergoing bariatric surgery. Other indications include gallstone dyspepsia and the presence of gallbladder polyps, where surgical removal may be preventive against potential malignancy. Overall, cholecystectomy remains a cornerstone in the management of gallbladder-related disorders, with the choice between open and laparoscopic methods influenced by various factors including patient characteristics and surgeon preference.

Laparoscopic Anatomy: During laparoscopic cholecystectomy, the anatomical perspective around Calot's triangle can undergo alterations, potentially leading to misidentification of structures and complications. Several factors contribute to this phenomenon. For instance, different methods of retraction used during the procedure may inadvertently flatten Calot's triangle instead of opening it up,

distorting its appearance. Additionally, the posterior or reverse dissection approach commonly employed in laparoscopic procedures can further obscure the anatomical landmarks, especially when the gallbladder is flipped over. A key anatomical feature in laparoscopic cholecystectomy is Rouviere's sulcus, a fissure located on the liver between the right lobe and the caudate process. This sulcus serves as an extrabiliary reference point that remains unaffected by pathological changes. It plays a critical role in preventing injury to the bile duct during dissection. It is emphasized that all dissection should be conducted above or anterior to this sulcus to ensure safety and minimize the risk of complications. Another essential aspect is ensuring a clear visualization of the junction between the cystic duct and the gallbladder, as well as the space between the gallbladder and the liver. This space should ideally be free of any structures other than the cystic artery to reduce the likelihood of bile duct injury. To address the challenges posed by anatomical distortion and ensure patient safety, the concept of Critical View of Safety (CVS) or Critical View of Strasberg has been introduced. This approach involves securely identifying the cystic duct and artery before detaching the gallbladder from the cystic plate. By ensuring that the gallbladder is attached only by these two cystic structures, surgeons can obtain a clear and secure anatomical view before proceeding with dissection and removal of the gallbladder, thereby reducing the risk of complications. [33]

LAPAROSCOPIC CHOLECYCTECTOMY: Establishing a pneumoperitoneum and positioning ports are vital steps in laparoscopic surgeries such as cholecystectomy. The periumbilical region is often preferred for Veress needle insertion due to its thinness and lack of operative scars. To ensure accurate placement, a cautious approach is taken. A transverse or vertical stab is made using a knife, followed by the insertion of the Veress needle through the abdominal wall at an appropriate angle, typically 45 degrees caudally or perpendicular, depending on patient obesity. Several confirmatory maneuvers are then employed to verify intra-peritoneal positioning of the needle. the absence of blood or bowel contents upon needle aspiration and irrigation confirms correct placement. A saline drop test is then conducted to ensure free flow of liquid into the peritoneal cavity, typically by observing the saline drop freely flowing with abdominal wall elevation. Additionally, gentle back-and-forth movements of the needle indicate free movement within the peritoneal cavity. Insufflation of CO2 is initiated, with an initial pressure of less than 10 mmHg indicating proper intra-abdominal positioning. Tympany in all four abdominal quadrants confirms sufficient insufflation, typically achieved with a flow rate of around 2.5 L/min through the Veress needle. Once an intra-abdominal pressure of 15 mmHg is reached, the Veress needle is removed, and trocars are inserted through the same site. Trocar insertion involves firm pressure while elevating the abdominal wall, ensuring proper placement. After insertion, the inner trocar can be removed, leaving the outer cannula and sheath

in place. Opening the stopcock or flapper valve on the port allows CO2 passage after connecting the insufflation line to the sheath. Subsequent steps involve inserting a video telescope for peritoneal cavity inspection, assessing visceral organs and retroperitoneum for injuries. Additional trocars are inserted under direct vision, typically a 10mm epigastric port inserted just below the costal margin or liver edge, a 5mm mid-clavicular port over the gallbladder fundus, and a lateral 5mm port anterior to the lateral peritoneal attachment of the ascending colon or right iliac fossa. These meticulous steps ensure proper port placement and a safe laparoscopic cholecystectomy procedure.

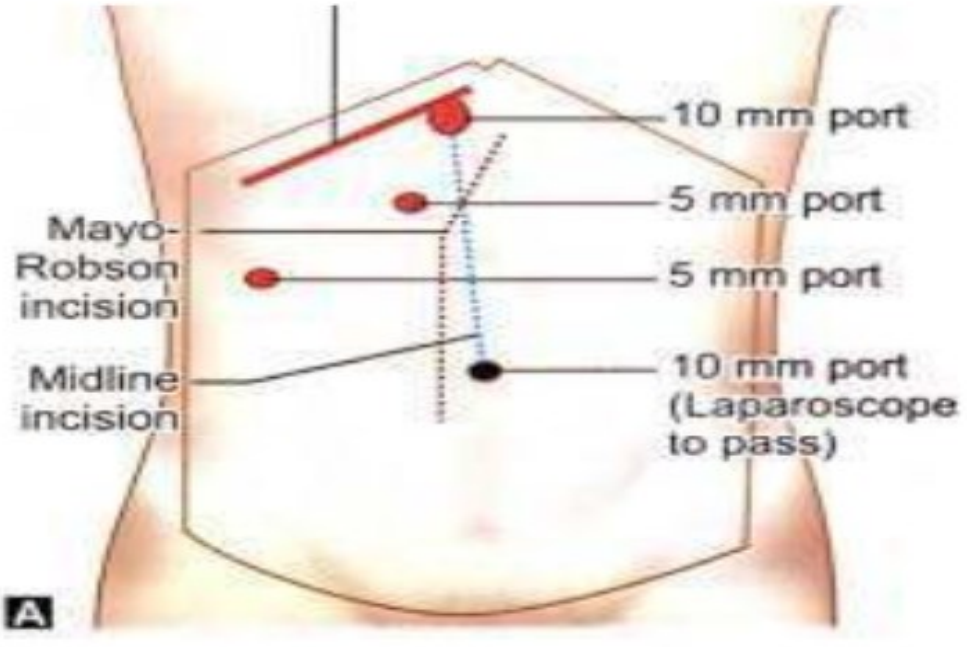
It is the most popular method to remove gallbladder. It is the gold standard treatment for gallstone.

POSITION

- Supine, head end up and right side tilt.
- Anaesthesia - General anaesthesia.

PORTS

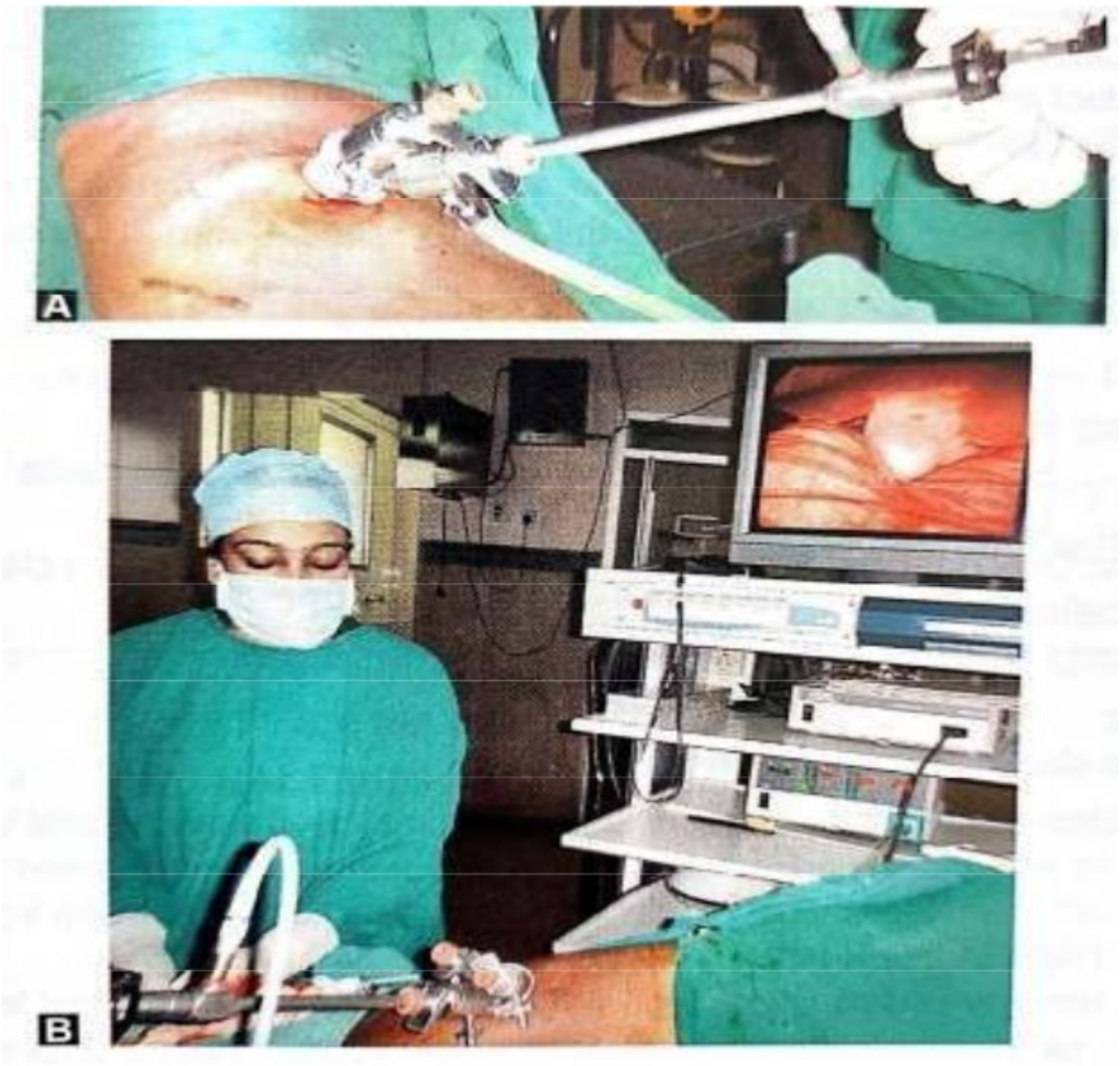
- 10 mm port in umbilicus to pass 10 mm 30 degree telescope.
- 10 mm port in midline epigastrium as working channel.
- Two 5 mm ports, one at midclavicular line and another one at anterior axillary line in subcostal region.



PORT PLACEMENT IN LAPAROSCOPIC CHOLECYSTECTOMY

SINGLE INCISION LAPAROSCOPIC SURGERY (SILS) IN CHOLECYSTECTOMY: Single-Incision Laparoscopic Surgery (SILS) stands out as a pioneering approach in the realm of minimally invasive surgical procedures. It enables surgeons to conduct entire operations through a solitary entry point located at the umbilicus. This technique, alternatively referred to as Single Port Access Surgery (SPA), One Port Umbilical Surgery (OPUS), or Single Port Incision-Less Conventional Equipment-Utilizing Surgery (SPICES), represents a remarkable evolution in surgical innovation. To perform SILS, patients typically undergo general anesthesia. Specialized umbilical large trocars, meticulously crafted to accommodate working instruments alongside a flexible laparoscope, are utilized. These instruments often include rotatable reticulators, articulating handles, and precision tools like the harmonic scalpel, ensuring

optimal maneuverability and surgical precision. The procedure commences with a substantial 2.5 cm vertical incision at the umbilicus, created using an open method to gain access to the peritoneal cavity. A specialized port, engineered to accommodate a 10 mm telescope and two 5 mm instruments for operative tasks, is then meticulously positioned. One of the distinctive features of SILS is the design of its instruments. Crafted to be angled and flexible, these tools adhere to ergonomic principles, enhancing the surgeon's dexterity and facilitating intricate maneuvers within the confined space of the operative field. This adaptability, often referred to as reticulation, ensures optimal performance during the procedure.



SINGLE INCISION LAPAROSCOPIC SURGERY (SILS) IN CHOLECYSTECTOMY

Throughout the SILS procedure, the dissection of anatomical structures, such as the gallbladder, follows a methodology akin to traditional laparoscopic techniques. However, the wider umbilical port facilitates easier retrieval of specimens, streamlining the operative process. SILS offers a degree of versatility unparalleled in conventional laparoscopic procedures. Should challenges arise during the operation, additional ports can be introduced as necessary, enabling

surgeons to optimize visualization and access to the surgical site. SILS represents a paradigm shift in minimally invasive surgery, offering patients the benefits of reduced scarring, faster recovery times, and enhanced cosmetic outcomes. Its versatility and adaptability make it a valuable asset in the surgical armamentarium, paving the way for further advancements in the field of minimally invasive surgery.

Manoj Kumar et al and colleagues in 2007 [34], the researchers delved into the nuances of laparoscopic cholecystectomy, a common surgical procedure for gallbladder removal. They sought to compare the outcomes between two surgical approaches: the traditional four-port laparoscopic cholecystectomy and a newer, potentially less invasive three-port variation. The study design was rigorous, employing a randomized controlled clinical trial methodology. This meant that patients were randomly assigned to undergo either the three-port or four-port procedure, ensuring unbiased comparisons between the two groups. One of the key metrics examined was operative time, or how long the surgery took to complete. Here, the researchers found a notable difference: the three-port approach resulted in shorter operative times compared to the four-port method. This finding is significant because shorter operative times can translate to reduced anesthesia exposure for the patient and increased efficiency in the operating room. Beyond operative time, the researchers also investigated postoperative outcomes, including pain levels, analgesia requirements, and length of hospital stay. They discovered that patients who underwent the three-port procedure experienced less pain at the individual port sites compared to those who underwent the four-port approach. This suggests that minimizing the number of incisions may lead to decreased postoperative discomfort for patients. the study evaluated the amount of pain medication required by patients following surgery. Interestingly, those in the three-port group tended to require less analgesia, indicating potentially milder postoperative pain compared to their counterparts in the four-port group. the

researchers assessed the length of hospital stay, an important indicator of recovery and resource utilization. While the study did not find significant differences in hospital stay between the two groups, the trend towards shorter operative times and reduced postoperative pain in the three-port group may indirectly contribute to expedited recovery and discharge. despite the differences observed in operative time and postoperative pain, both surgical approaches demonstrated similar overall clinical outcomes and patient satisfaction levels. This suggests that while the three-port technique may offer advantages in terms of efficiency and pain management, it does not compromise the quality or success of the surgery. the study by Manoj Kumar et al. provides valuable insights into the comparative effectiveness of three-port versus four-port laparoscopic cholecystectomy. By highlighting potential benefits such as shorter operative times and reduced postoperative pain with the three-port approach, the findings underscore the importance of considering alternative surgical techniques to optimize patient outcomes and satisfaction.

In 2015, Shams ul Bari and colleagues [35], the aim was to compare the technical feasibility, safety, and various outcomes between three-port and four-port laparoscopic cholecystectomy. Although the specific year of the study was not mentioned, the findings provide valuable insights into these surgical techniques. The study meticulously evaluated several critical factors including operative time, complications, postoperative pain levels, and analgesia requirements. This comprehensive approach allowed for a thorough assessment of the benefits and

drawbacks associated with each surgical method. The results of the study were promising for the three-port technique. Bari et al. concluded that this approach was not only as safe as the standard four-port technique but also offered several advantages. These included reduced postoperative pain levels and a lower requirement for analgesic medication. Additionally, patients who underwent the three-port procedure enjoyed better cosmetic results, which can contribute to enhanced patient satisfaction and psychosocial well-being during the recovery period. This study adds to the growing body of evidence supporting the feasibility and safety of the three-port laparoscopic cholecystectomy. By highlighting its potential benefits such as decreased postoperative pain and improved cosmetic outcomes, it provides valuable insights for surgeons and patients when considering the most appropriate surgical approach.

In 2018, Harish Chauhan et al [36] and collaborators conducted a prospective comparative clinical study that echoed the findings of previous research on the topic of laparoscopic cholecystectomy. Like their predecessors, Chauhan et al. aimed to assess the safety, efficacy, and potential benefits of the three-port technique compared to the traditional four-port approach. Their study, much like those before it, reaffirmed that the three-port method was comparable in safety and efficacy to the four-port technique. Moreover, it corroborated the observed advantages associated with the three-port approach, such as shorter operative times and reduced postoperative analgesia requirements. These consistent findings across multiple studies provide robust evidence supporting the viability

of the three-port laparoscopic cholecystectomy. They underscore its potential as a safe and effective alternative to the conventional four-port method, offering surgeons and patients alike a valuable option for consideration in clinical practice.

Mohammed A. Omar and fellow researchers in 2017 [37], they embarked on a comparative study examining distinct methodologies employed in laparoscopic cholecystectomy. Specifically, they juxtaposed the efficacy of a single-incision laparoscopic approach with that of the more conventional three-port technique. Beyond merely scrutinizing the procedural variances, their study provided illuminating insights into the multifaceted impact of minimally invasive surgical modalities on patient outcomes. The study yielded intriguing results indicating that single-incision laparoscopic cholecystectomy not only demonstrated commendable safety profiles but also yielded superior cosmetic outcomes in contrast to its three-port counterpart. This suggests that patients undergoing the former approach might benefit from reduced scarring or aesthetically more pleasing postoperative appearances. Such findings hold substantial significance as they contribute significantly to the evolving discourse surrounding the efficacy and desirability of various laparoscopic techniques. By showcasing the safety and potential aesthetic advantages of single-incision procedures, this research broadens the spectrum of options available to surgeons and patients alike, potentially influencing the future landscape of surgical practice. it would be pertinent to explore whether the study also delved into ancillary aspects such as postoperative recovery times or the incidence of complications. Such

supplementary insights would furnish a more comprehensive understanding of the holistic impact of these divergent surgical approaches on patient well-being.

Peeyush Kumar et al and colleagues in 2018 [38], at a tertiary care center in North India, shed light on the safety outcomes and advantages associated with two common approaches to laparoscopic cholecystectomy: the three-port and four-port techniques. Through their meticulous examination, the researchers provided valuable insights into the potential merits of each method. Their findings echoed the consensus that the three-port procedure stands as a safe and potentially more cost-effective alternative to its four-port counterpart. Notably, patients who underwent the three-port approach reported experiencing less postoperative pain, enjoyed shorter hospital stays, and emerged with enhanced cosmetic outcomes compared to those subjected to the four-port technique. This study's implications reverberate throughout the surgical community, offering practitioners valuable guidance in selecting the most appropriate approach for their patients. Moreover, the observed advantages of the three-port method, including reduced pain and improved cosmetic results, underscore its potential to enhance patient satisfaction and recovery trajectories. Given the nuanced nature of surgical decision-making, it would be beneficial for future research to explore additional factors such as long-term outcomes and economic considerations, thereby further enriching our understanding of the comparative merits of these laparoscopic techniques.

In 2022, Lawrence Nip et al [39] and his team undertook a systematic review and meta-analysis to compare the outcomes of three-port and four-port laparoscopic

cholecystectomy procedures. Their extensive review encompassed data from 18 trials involving over 2000 patients. The focus was on several key metrics including hospital stay duration, postoperative pain management, operative time, success rates, and occurrence of adverse events. The thorough analysis conducted by Nip et al. provided valuable insights into the relative effectiveness of these surgical techniques. Their conclusion highlighted the three-port approach as a viable option, particularly for surgeons with appropriate training. Noteworthy benefits associated with the three-port method included shorter hospital stays and decreased postoperative pain levels. This study serves as a valuable resource for surgeons, offering evidence-based guidance in selecting the most appropriate approach for laparoscopic cholecystectomy. By synthesizing data from a diverse range of studies, Nip et al. have significantly advanced our understanding of the comparative merits of these techniques, enabling surgeons to make well-informed decisions aimed at optimizing patient outcomes. As surgical practices continue to evolve, further research could explore additional factors such as long-term patient satisfaction and economic considerations. This ongoing investigation will contribute to the ongoing refinement and enhancement of surgical strategies.

MATERIALS AND METHOD

STUDY AREA- Department of General Surgery, Santosh medical college and hospital.

STUDY DESIGN- Prospective Comparative study

DURATION OF STUDY- 1.5 years

SAMPLE SIZE- 124

$$n_1 = \frac{(\sigma_1^2 + \sigma_2^2 / \kappa)(z_{1-\alpha/2} + z_{1-\beta})^2}{\Delta^2}$$

Where, N (population size) =1000000

p (hypothesized % frequency of outcome factor in population) =16%±5

d (confidence limit as % of 100) =5%

Inclusion criteria:

- Male and female between age 18 to 60 years.
- Patients presenting with cholelithiasis diagnosed by radiological modalities.
- Patients undergoing laparoscopic cholecystectomy for gallbladder calculus

Exclusion patients

- Age <18 years and >60 years
- Patients refused to be part of the study

- Patients with CBD calculus who needs CBD exploration.
- Patients presenting with obstructive jaundice.
- Gallbladder malignancy

Methodology: After taking the required consent, patients were assessed under the following: The general bio-data of the patient regarding his name, age, sex, religion, occupation, socioeconomic status, and address. A detailed history with special reference to the duration of right upper quadrant pain or epigastric pain, its periodicity, its aggravation by fatty meals, and relief by analgesics. Any significant past history was also enquired. A relevant general physical examination, abdominal, and systemic examination was done. Diagnosis was confirmed by ultrasound whole abdomen. Pre-operative workup included routine lab investigations, chest-X-Ray, and ultrasound of the abdomen. A routine pre-anesthetic checkup was done for all patients(PROFORMA).A fully explained well-informed consent was taken from all patients undergoing surgery and with an explanation of the risk of conversion to open cholecystectomy (CONSENT) . A fully explained informed consent was also taken from patients for including in the study. All the patient were randomly assigned into 3 port and 4 port surgical method using envelope system. All cases received prophylactic pre-op antibiotics. The analyzed data were compared with other studies in literature and discussed. A master chart dealing with all aspects was designed and presented. A proforma was used for the study purpose.

Study Tools:

- History
- Clinical examination (Preoperative, postoperative)
- Anthropometry
- Investigations

Preoperatively Investigation

- Complete blood count
- Liver function tests
- Fasting and post prandial blood sugar
- Serum urea, creatinine

Radiological Investigation

- Ultrasonography of abdomen
- Chest X-ray
- Abdominal radiograph

Postoperatively

- Clinical examination of the patient and additional tests based on the necessity following clinical examination.
- Operative notes - Duration of surgery, number of ports inserted, If conversion to open was done.

Data management and Statistical Analysis: The data was collected and entered in MS Excel 2019. Different statistical analyses were performed using Stata MP-17. The one-sample Kolmogorov–Smirnov test was employed to determine whether the datasets differed from a normal distribution or not. Normally distributed data were analyzed using parametric tests, and non-normally distributed data were analyzed using non-parametric tests. Descriptive statistics were calculated for qualitative and categorical variables. Graphical representation of the variable was shown to understand the results clearly, and to measure the association for categorical dataset was analyzed using Chi-Square test. Independent T-test or Student t-test was applied to measure the mean difference between two groups. Correlation was estimated to measure the strength of relationship between two or more quantitative variables.

If p value <0.05, then it was statistically significant & if p value >0.05 then it was statistically insignificant.

RESULT

Table:1 Distribution of Laparoscopic Ports Used Across Different Age Groups

"AGE RANGE"	"NO. OF PORTS"	Counts	% of Total
<20	3-port	3	2.4 %
	4-port	0	0.0 %
21-30	3-port	17	13.7 %
	4-port	11	8.9 %
31-40	3-port	22	17.7 %
	4-port	16	12.9%
41-50	3-port	16	3.2 %
	4-port	21	16.9 %
51-60	3-port	4	3.2 %
	4-port	14	11.3 %

The above table represents the distribution of laparoscopic ports used across different age groups. It categorizes patients into five age groups (<20, 21-30, 31-40, 41-50, and 51-60 years) and compares the frequency and percentage of 3-port and 4-port laparoscopic procedures. The highest number of 3-port procedures was observed in the 31-40 age group (22 cases, 17.7%), followed by the 21-30 age group (17 cases, 13.7%) and the 41-50 age group (16 cases, 12.9%). Similarly, the highest number of 4-port procedures was recorded in the 41-50 age group (21 cases, 16.9%), followed by the 31-40 age group (16 cases, 12.9%) and the 51-60 age group (14 cases, 11.3%). The <20 age group had the lowest count, with only three cases of 3-port procedures and no 4-port procedures. The data highlights the variation in port selection across different age groups, with a notable preference for 4-port procedures in older age groups.

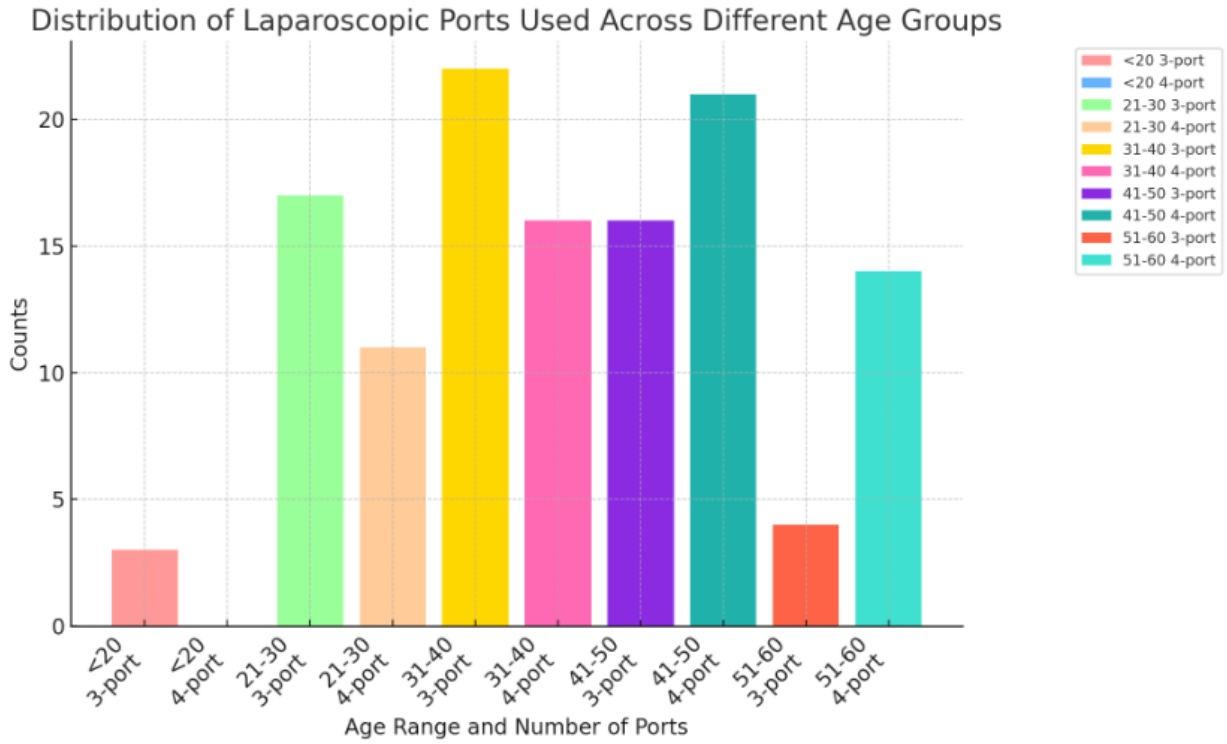


Table:2 Distribution of Laparoscopic Ports by Gender: A Comparative Analysis

"GENDER"	"NO. OF PORTS"	Counts	% of Total
Female	3-port	44	35.5 %
	4-port	42	33.9 %
Male	3-port	18	14.5 %
	4-port	20	16.1 %

The above table represents the distribution of laparoscopic ports by gender, providing a comparative analysis of the number of ports used in male and female patients. Among females, 44 cases (35.5%) underwent a 3-port laparoscopic procedure, while 42 cases (33.9%) underwent a 4-port procedure. In males, 18 cases (14.5%) had a 3-port procedure, whereas 20 cases (16.1%) underwent a 4-port procedure. This data highlights the gender-wise variation in the utilization of different laparoscopic port configurations.

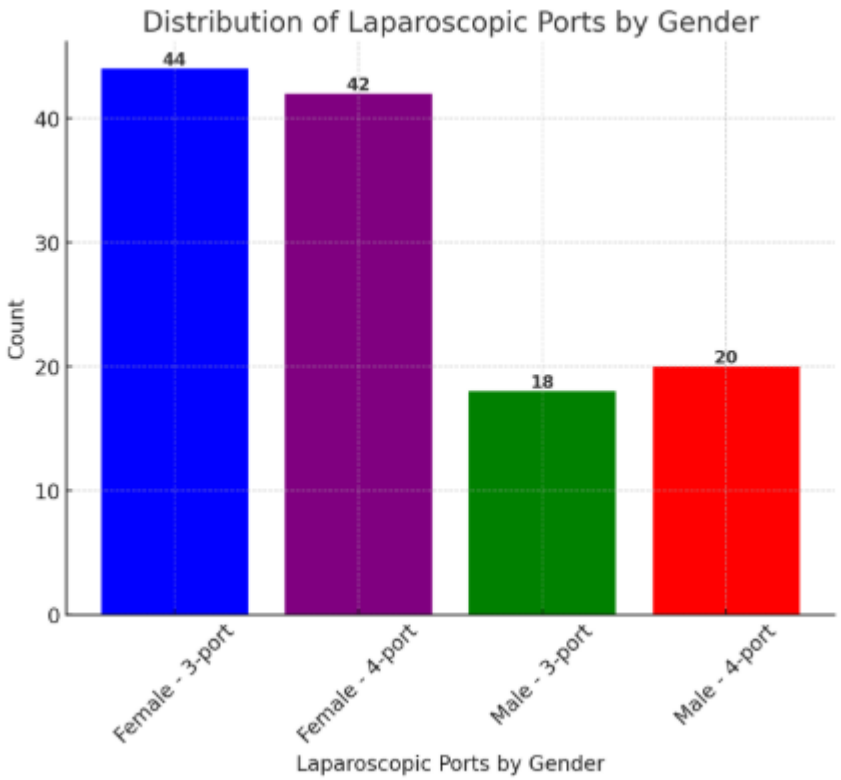


Table:3 Distribution of Number of Ports Used in Relation to Diabetes Status

"DIABETES"	"NO. OF PORTS"	Counts	% of Total	P value
No	3-port	60	48.4 %	0.25
	4-port	57	46.0 %	
Yes	3-port	2	1.6 %	
	4-port	5	4.0 %	

The above table represents the distribution of the number of ports used in relation to diabetes status. Among non-diabetic patients, 60 (48.4%) underwent surgery using a 3-port technique, while 57 (46.0%) had a 4-port technique. In diabetic patients, 2 (1.6%) underwent surgery with a 3-port technique, whereas 5 (4.0%) had a 4-port technique. The P-value of 0.25 indicates that there is no statistically significant association between diabetes status and the choice of surgical technique. This data highlights the proportional distribution of surgical approaches based on diabetes status, with the majority of cases being non-

diabetic, and a relatively lower number of diabetic patients undergoing surgery with either technique.

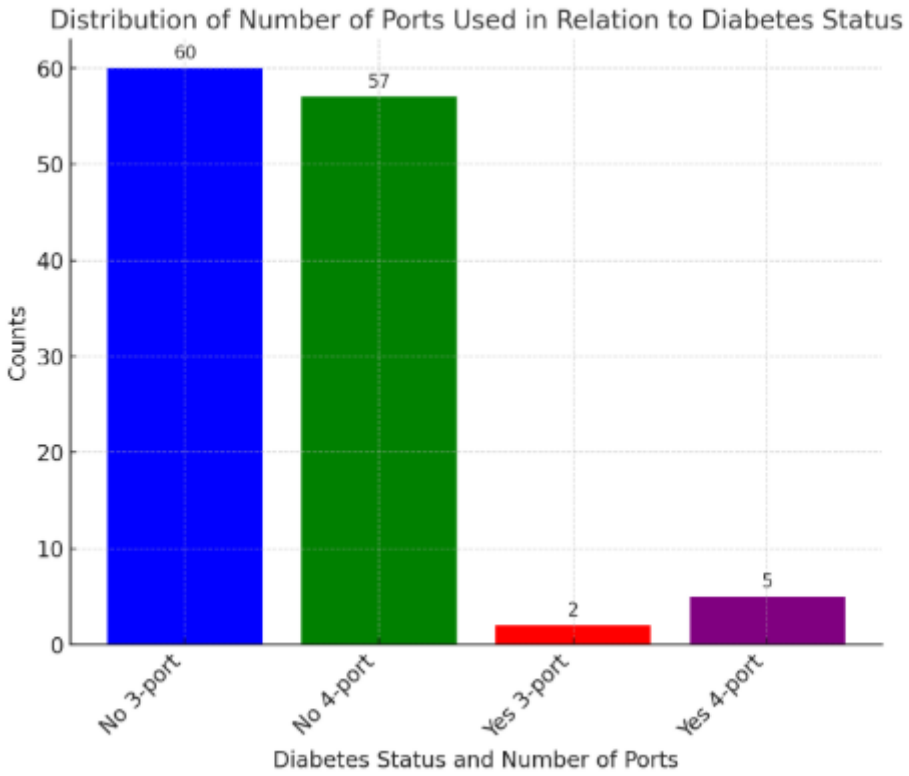


Table:4 Distribution of Surgical Ports Based on Hypertension Status

"HYPERTENSION"	"NO. OF PORTS"	Counts	% of Total	P value
No	3-port	58	46.8 %	0.15
	4-port	60	48.4 %	
Yes	3-port	4	3.2 %	
	4-port	2	1.6 %	

The above table represents the distribution of surgical ports based on the hypertension status of patients. It shows the number and percentage of patients with and without hypertension who underwent either a 3-port or 4-port surgical procedure. Among patients without hypertension, 46.8% underwent a 3-port procedure, while 48.4% underwent a 4-port procedure. In contrast, among

hypertensive patients, 3.2% underwent a 3-port procedure, whereas only 1.6% underwent a 4-port procedure. The P-value of 0.15 indicates that there is no statistically significant association between hypertension status and the choice of surgical technique. This distribution suggests that the majority of patients, irrespective of their hypertension status, underwent the 4-port procedure.

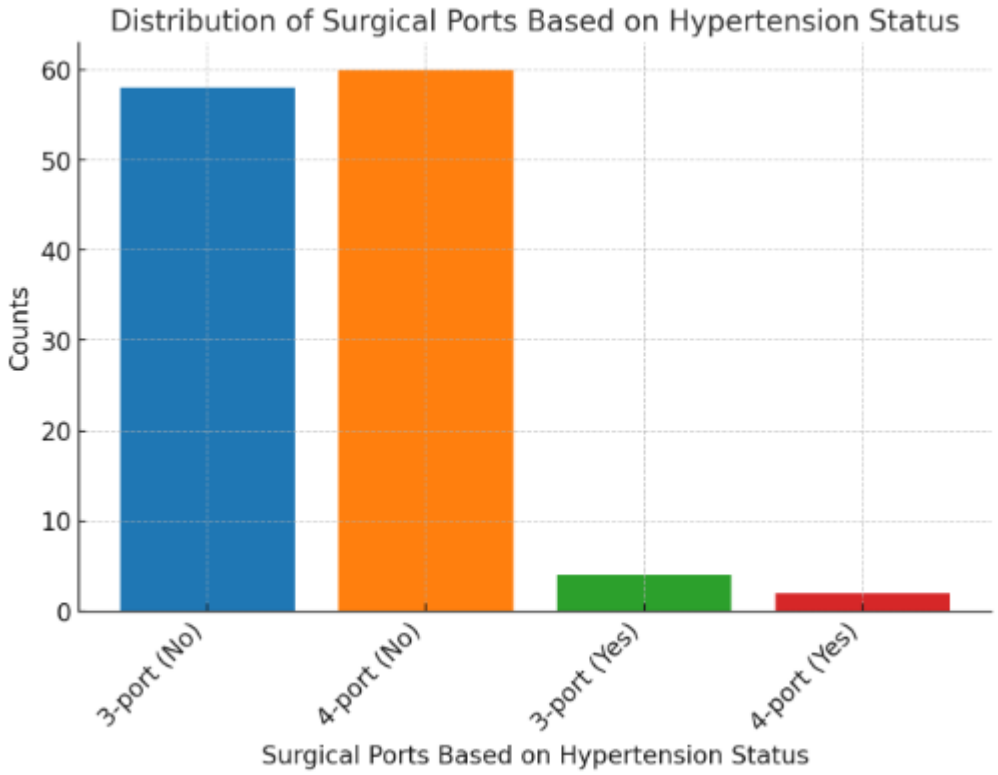


Table:5 Impact of Previous Abdominal Surgery on the Number of Ports Used in Laparoscopic Procedures

"PREVIOUS ABDOMINAL SURGERY"	"NO. OF PORTS"	Counts	% of Total
No	3-port	53	42.7 %
	4-port	55	44.4 %
Yes	3-port	9	7.3 %
	4-port	7	5.6 %

The above table represents the impact of previous abdominal surgery on the number of ports used in laparoscopic procedures. Among patients with no history

of previous abdominal surgery, 53 cases (42.7%) underwent a 3-port procedure, while 55 cases (44.4%) required a 4-port approach. In patients with a history of previous abdominal surgery (PS), 9 cases (7.3%) underwent a 3-port procedure, whereas 7 cases (5.6%) required a 4-port approach. The data suggest that the presence of prior abdominal surgery have no influence over selection of surgical technique.

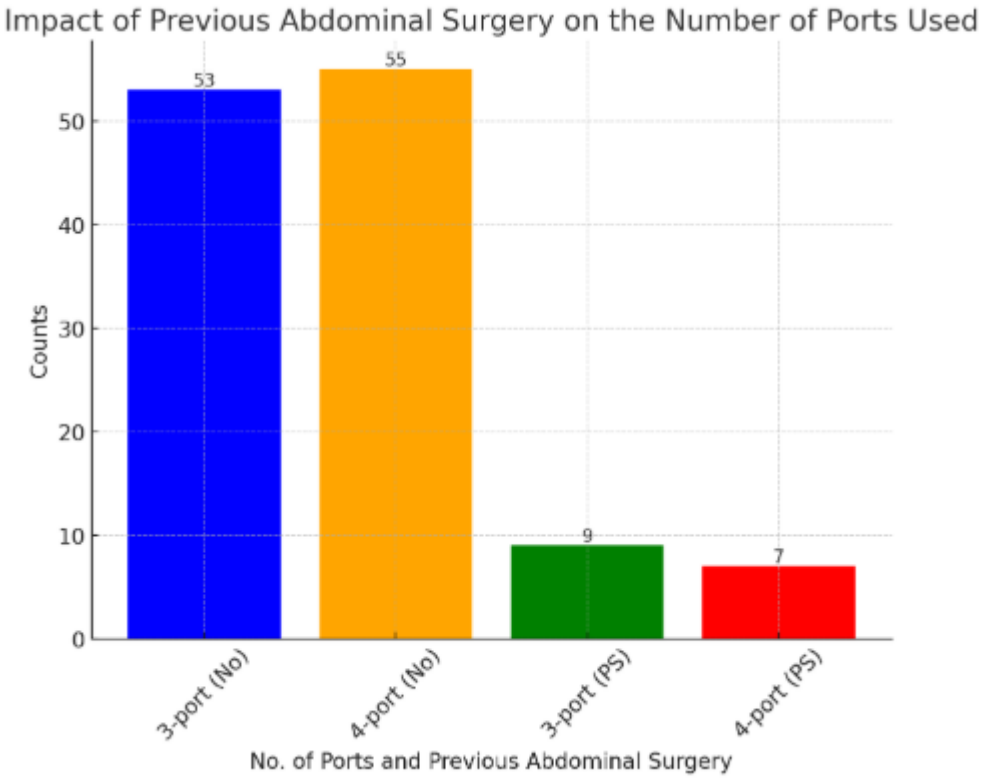


Table:6 Gallbladder Status and Port Configuration: Distribution and Frequency Analysis

"GB STATUS"	"NO. OF PORTS"	Counts	% of Total	P value
DISTENDED	3-port	23	18.5 %	0.95
	4-port	23	18.5 %	
WELL DISTENDED	3-port	26	21.0 %	
	4-port	24	19.4 %	

PARTIALLY DISTENDED	3-port	11	8.9 %	
	4-port	13	10.5 %	
DISTENDED AND EDEMATOUS	3-port	2	1.6 %	
	4-port	2	1.6 %	

The above table represents the distribution and frequency analysis of gallbladder (GB) status concerning port configuration in laparoscopic procedures. Among the cases, an equal proportion (18.5%) of distended gallbladders were observed in both 3-port and 4-port techniques. Well-distended gallbladders were slightly more common in the 3-port group (21.0%) compared to the 4-port group (19.4%). Partially distended gallbladders were noted in 8.9% of 3-port cases and 10.5% of 4-port cases. Distended and edematous gallbladders were the least common, accounting for only 1.6% in both 3-port and 4-port groups. The P-value of 0.95 indicates that there is no statistically significant association between gallbladder distension status and the choice of surgical technique. This analysis highlights the variation in gallbladder distension across different port configurations used in laparoscopic surgery.

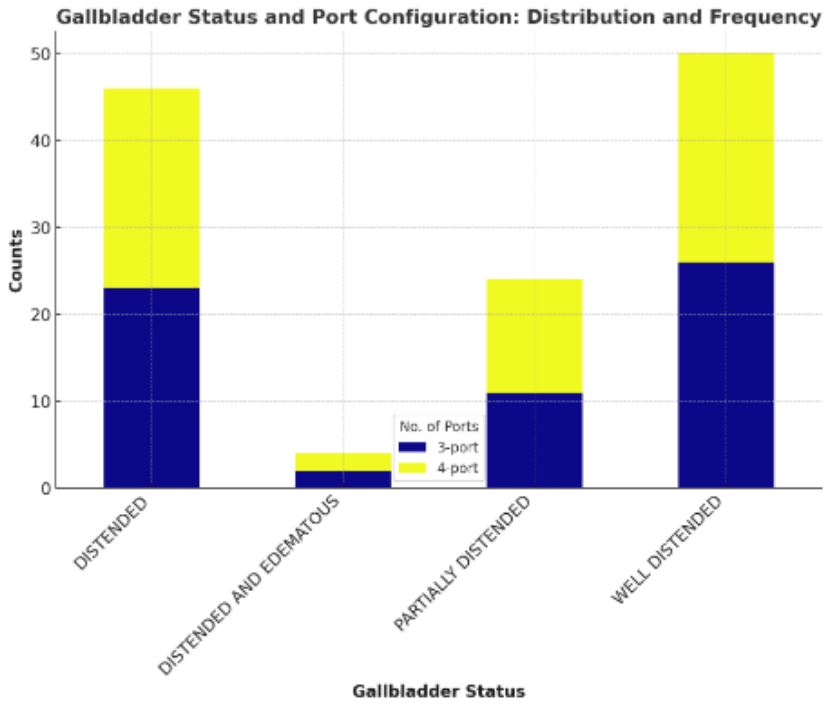


Table:7 Association of Pericholecystic Fluid with Number of Ports Used in Laparoscopic Cholecystectomy: A Distribution Analysis

"PERICHOLECYSTIC FLUID"	"NO. OF PORTS"	Counts	% of Total	P value
No	3-port	57	46.0 %	0.30
	4-port	59	47.6 %	
Yes	3-port	5	4.0 %	
	4-port	3	2.4 %	

The above table represents the association of pericholecystic fluid with the number of ports used in laparoscopic cholecystectomy. Among the patients who did not have pericholecystic fluid, 46.0% underwent the procedure using a 3-port technique, while 47.6% underwent it using a 4-port technique. In contrast, among those who had pericholecystic fluid, 4.0% were managed with a 3-port technique, whereas only 2.4% underwent the procedure with a 4-port technique. The P-value of 0.30 indicates that there is no statistically significant association between Pericholecystic fluid status of gallbladder and the choice of surgical technique. This distribution suggests a relatively similar occurrence of pericholecystic fluid

across both surgical techniques, with a slightly higher proportion observed in the 3-port group.

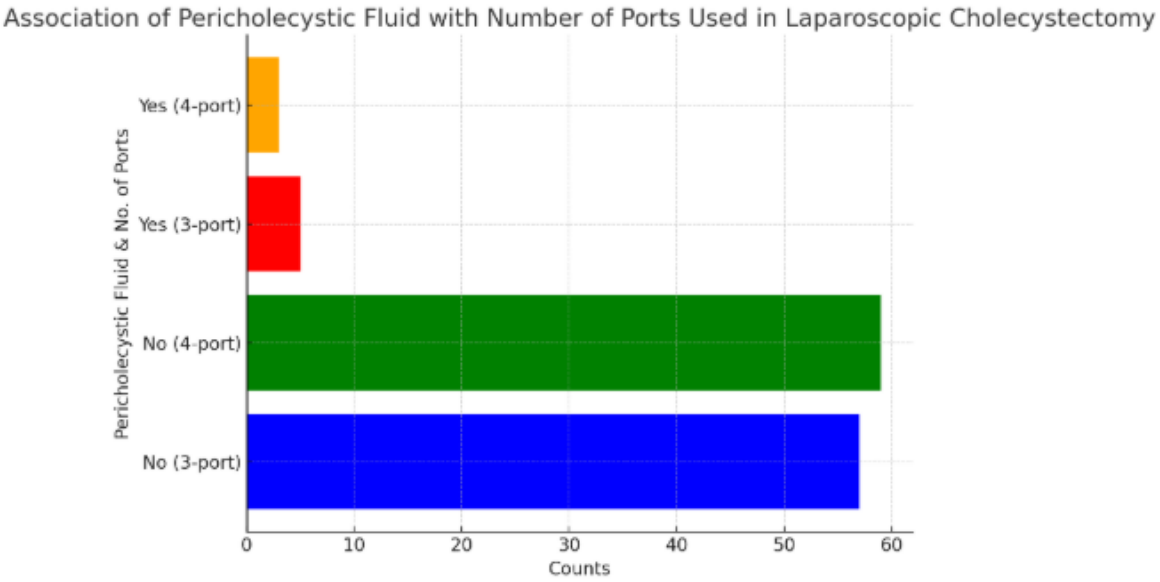


Table:8 Comparison of Port Numbers in Single vs. Multiple Gallstones Surgeries

"SINGLE/MULTIPLE STONES"	"NO. OF PORTS"	Counts	% of Total	P value
Multiple	3-port	46	37.1 %	0.80
	4-port	44	35.5 %	
Single	3-port	16	12.9 %	
	4-port	18	14.5 %	

The above table (Table 8) represents the comparison of the number of ports used in surgeries for single versus multiple gallstones. Among patients with multiple gallstones, 37.1% underwent surgery using a 3-port technique, while 35.5% had a 4-port procedure. In cases of single gallstones, 12.9% of patients were operated on using a 3-port approach, whereas 14.5% underwent a 4-port procedure. The P-value of 0.80 indicates that there is no statistically significant association between number of gallstones and the choice of surgical technique. This data

highlights the distribution of port numbers in gallstone surgeries, indicating a relatively balanced preference for 3-port and 4-port techniques across both single and multiple stone cases.

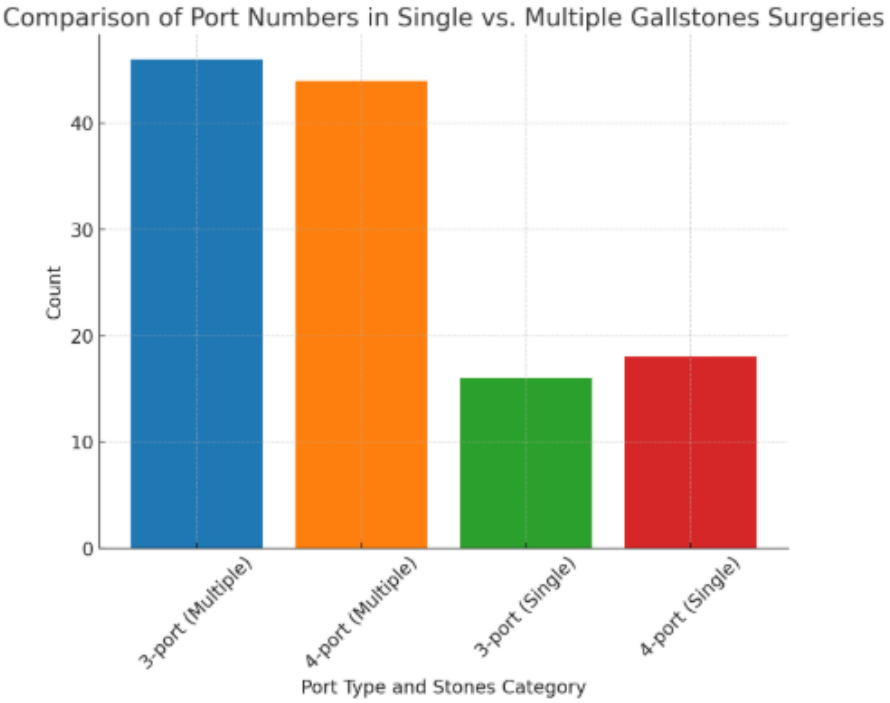


Table:9 Comparison of Operative Time Between 3-Port and 4-Port Techniques

	"NO. OF PORTS "	Mean	Median	SD	Minimum	Maximum	P value
"OPERATIVE TIME (MIN)"	3-port	65	63	11.72	52	128	<0.001
	4-port	104	103	9.3	90	120	

The above table (Table 9) represents the comparison of operative time between the 3-port and 4-port surgical techniques. A P-value of less than 0.001 suggests a highly significant difference between the two techniques . The mean operative time for the 3-port technique was 65 minutes, with a median of 63 minutes, a

standard deviation (SD) of 11.72, and a range of 52 to 128 minutes. In contrast, the 4-port technique had a higher mean operative time of 104 minutes, with a median of 103 minutes, a standard deviation of 9.3, and a range of 90 to 120 minutes. This indicates that the 4-port technique generally required a longer operative time compared to the 3-port technique.

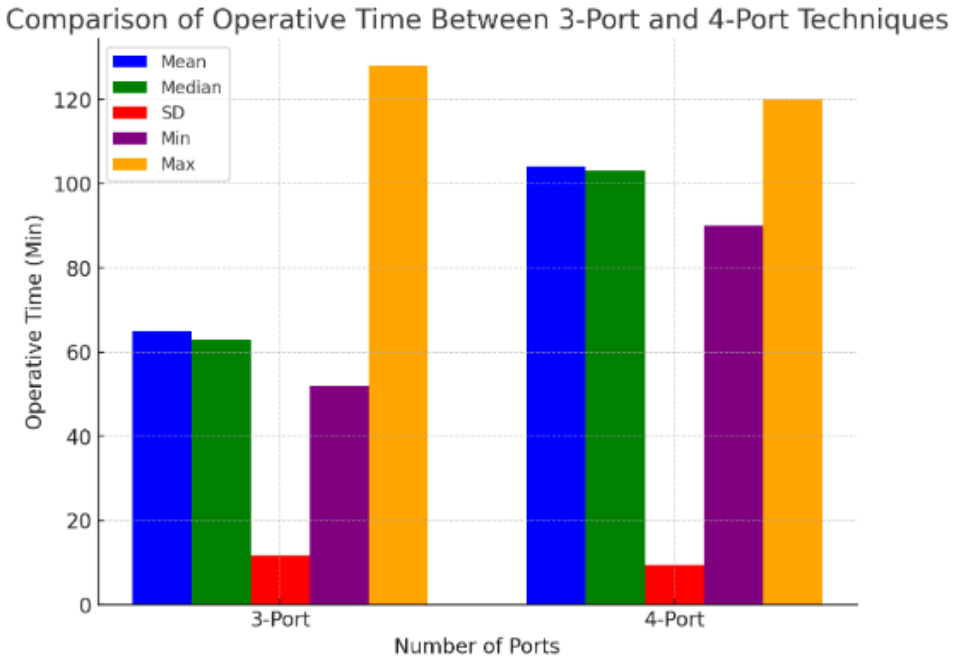


Table:10 Comparison of Intraoperative Complications Based on Number of Ports Used in Laparoscopic Cholecystectomy

"INTRA OPERATIVE COMPLICATION"	"NO. OF PORTS"	Counts	% of Total	P value
No	3-port	53	42.7 %	0.25
	4-port	58	46.8 %	
Vascular Injury-Liver Bed	3-port	3	2.4 %	
	4-port	1	0.8 %	
GallBladder Perforation-Bile Spillage	3-port	4	3.2 %	
	4-port	2	1.6 %	
Gallbladder Perforation-Stone Spillage	3-port	2	1.6 %	
	4-port	0	0.0 %	
Vascular Injury-Cystic Artery	3-port	0	0.0 %	

	4-port	1	0.8 %	

The above table represents **Table 10: Comparison of Intraoperative Complications Based on Number of Ports Used in Laparoscopic Cholecystectomy.** It compares the frequency and percentage of intraoperative complications encountered during 3-port and 4-port laparoscopic cholecystectomy. The P-value of 0.25 indicates that there is no statistically significant association between Intraoperative complication and the choice of surgical technique. The occurrence of no complications was slightly higher in the 4-port group (46.8%) compared to the 3-port group (42.7%). Vascular injury at the liver bed was more frequent in the 3-port group (2.4%) than in the 4-port group (0.8%). Gallbladder perforation with bile spillage occurred in 3.2% of cases in the 3-port group, whereas it was lower (1.6%) in the 4-port group. Similarly, gallbladder perforation with stone spillage was observed in 1.6% of 3-port cases but was absent in the 4-port group. Vascular injury to the cystic artery was reported in 0.8% of the 4-port cases, while no such cases were observed in the 3-port group. Overall, intraoperative complications varied slightly between the two approaches, with the 3-port technique showing a marginally higher rate of certain complications.

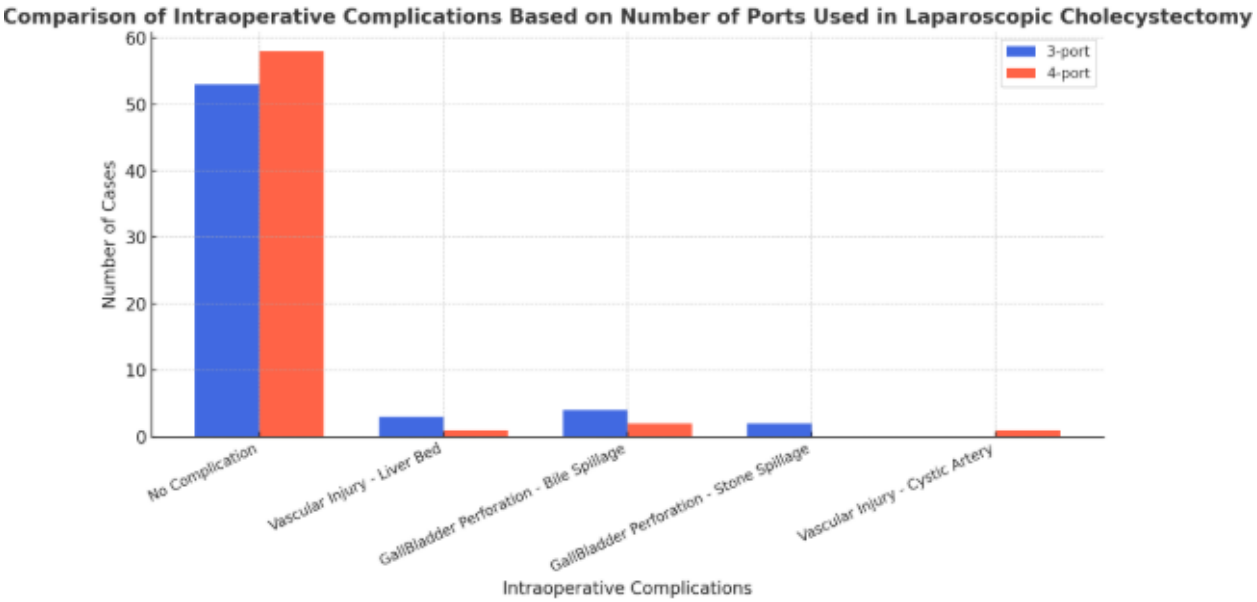


Table:11 Comparison of Post-Operative Complications Based on the Number of Ports Used in Surgery

"POST OPERATIVE COMPLICATION"	"NO. OF PORTS"	Counts	% of Total	P value
No	3-port	61	49.2 %	0.32
	4-port	62	50.0 %	
Surgical Site Infection	3-port	1	0.8 %	
	4-port	0	0.0 %	

The above table represents a comparison of post-operative complications based on the number of ports used in surgery. The P-value of 0.32 indicates that there is no statistically significant association between post operative complication amongst both surgical technique. A total of 124 cases were analyzed, with 61 (49.2%) undergoing a 3-port procedure and 62 (50.0%) undergoing a 4-port procedure. Among these cases, the majority did not experience any post-operative complications, accounting for 61 (49.2%) in the 3-port group and 62 (50.0%) in the 4-port group. Surgical site infection was observed in only one case (0.8%) in the 3-port group, while no cases of surgical site infection were reported in the 4-

port group. These findings suggest a comparable overall safety profile between the two approaches, with a slightly higher incidence of surgical site infection in the 3-port technique.

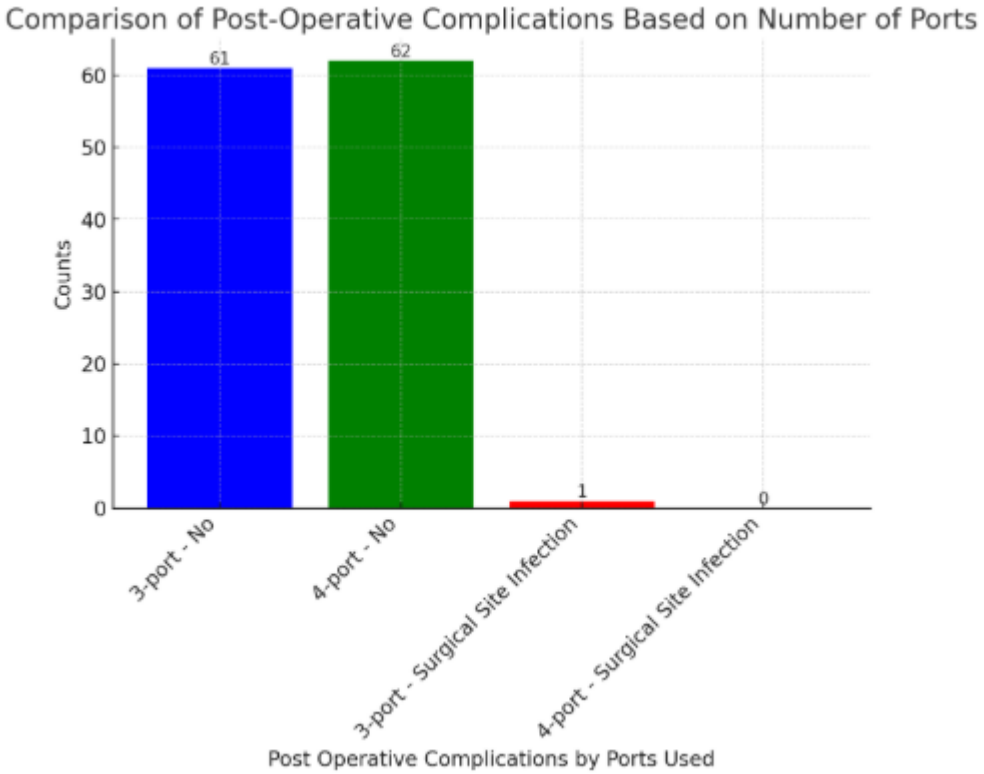


Table:12 Comparison of Postoperative Outcomes Between 3-Port and 4-Port Laparoscopic Procedures: Analgesia Requirement, Hospital Stay, and Recovery Time

	"NO. OF PORTS"	**Mean**	**Median**	**SD**	**Minimum**	**Maximum**	**P value**
"REQUIREMENT OF ANALGESIA (mg)"	3-port	116.13	112.5	50.224	75	375	<0.001
	4-port	262.5	262.5	37.806	225	300	
"HOSPITAL STAY"	3-port	1.98	2	0.914	1	6	<0.001
	4-port	4.79	5	0.75	4	6	

"NUMBER OF DAYS TO RETURN TO NORMAL ACTIVITY (mean)"	3-port	4.73	5	0.793	4	7	≈ 0.30
	4-port	4.87	5	0.82	4	6	

The above table represents a comparison of postoperative outcomes between 3-port and 4-port laparoscopic procedures in terms of analgesia requirement, hospital stay, and recovery time. A P-value of less than 0.001 suggests a highly significant difference between the two techniques in terms of requirement of analgesia. As per study mean analgesia requirement was significantly lower in the 3-port group (116.13 mg) compared to the 4-port group (262.5 mg), with a wider standard deviation in the 3-port group (50.224) than in the 4-port group (37.806). A P-value of less than 0.001 suggests a highly significant difference between the two techniques in terms of hospital stay. The hospital stay was notably shorter for patients undergoing the 3-port procedure, with a mean duration of 1.98 days compared to 4.79 days for the 4-port group. The median hospital stay was 2 days for the 3-port group and 5 days for the 4-port group. A P-value equivalent to 0.33 suggests no significant difference between the two techniques in terms of number of days return to normal activity. The number of days required to return to normal activity was comparable between the two groups, with a mean of 4.73 days in the 3-port group and 4.87 days in the 4-port group. The minimum and maximum duration for resuming normal activity ranged from 4 to 7 days in the 3-port group and 4 to 6 days in the 4-port group. These

findings indicate that the 3-port technique is associated with a lower analgesia requirement and shorter hospital stay, with similar recovery times compared to the 4-port approach.

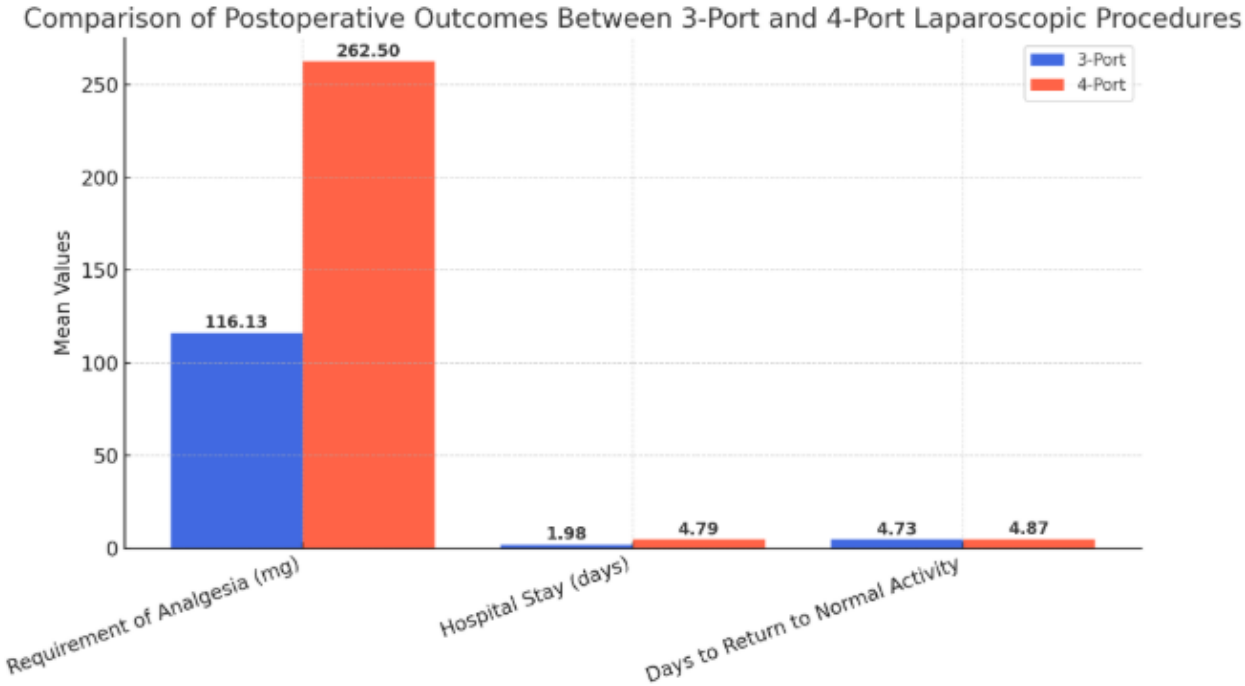


Table:13 Comparison of Laparoscopic Port Configurations and Their Association with Conversion to Open Surgery

"CONVERSION TO OPEN"	"NO. OF PORTS"	Counts	% of Total	P value
No	3-port	61	49.2 %	0.32
	4-port	62	50.0 %	
Yes	3-port	1	0.8 %	
	4-port	0	0.0 %	

The above table represents a comparison of laparoscopic port configurations and their association with conversion to open surgery. A P-value of 0.32 suggests no significant difference between the two techniques in terms of conversion to open surgery. Among the total cases, 49.2% underwent surgery using a 3-port technique, while 50.0% were managed with a 4-port approach. Conversion to

open surgery was required in only 0.8% of cases utilizing the 3-port technique, whereas no cases required conversion in the 4-port group (0.0%). This suggests that the 4-port technique may be associated with a lower rate of conversion to open surgery compared to the 3-port approach.

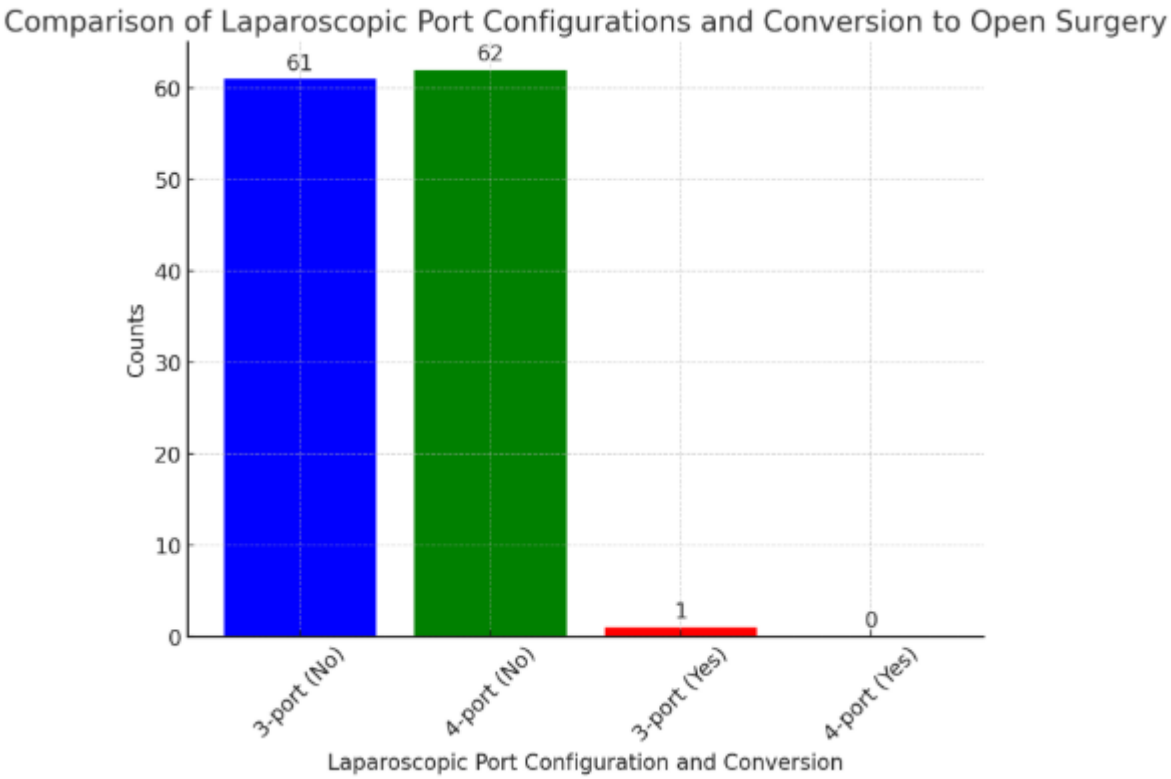


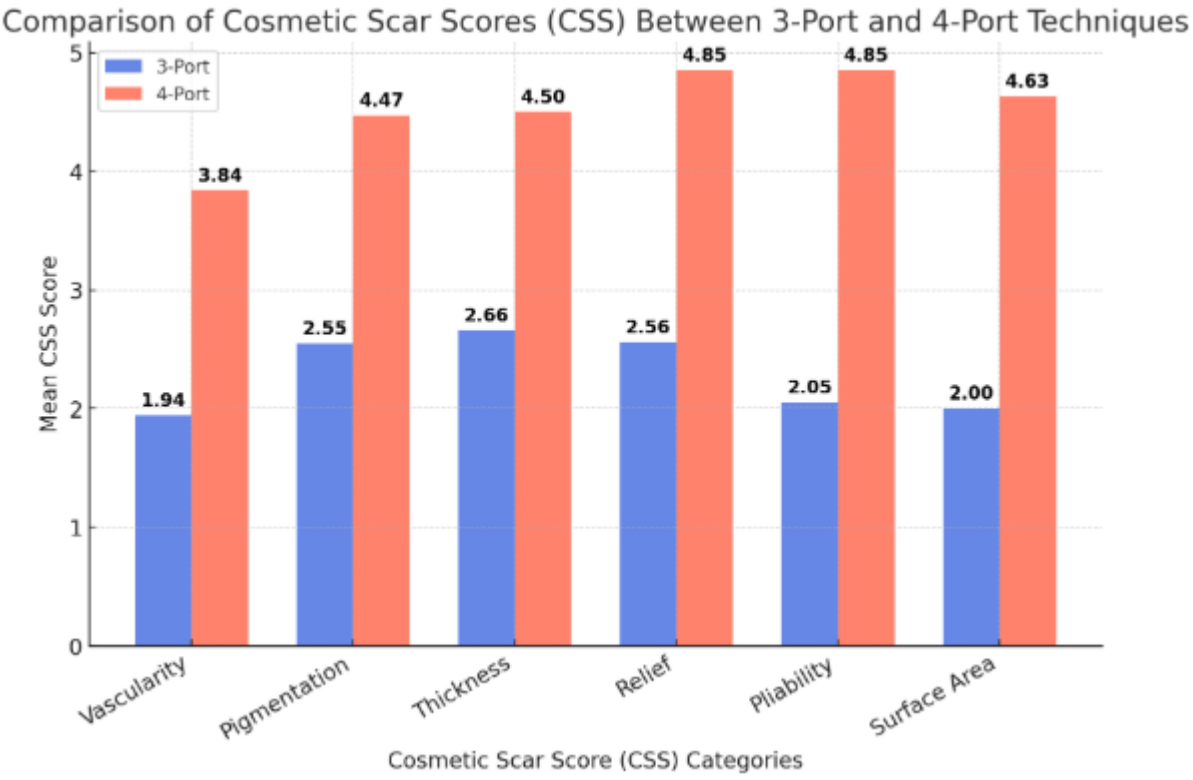
Table:14 Comparison of Scar Characteristics Using the Patient And Observer Scar Assessment Scale (POSAS)Between 3-Port and 4-Port Laparoscopic Procedures

	"NO. OF PORTS"	Mean	Median	SD	Minimum	Maximum	P value
"vascularity"(CSS)	3-port	1.94	2	0.921	1	4	<0.001
	4-port	3.84	4	0.751	3	5	
"Pigmentation"(CSS)	3-port	2.55	2	0.783	1	4	

	4-port	4.47	4	0.804	3	6	
"thicknees"(CSS)	3-port	2.66	3	0.974	1	4	
	4-port	4.5	5	1.004	3	6	
"Relief"(CSS)	3-port	2.56	3	1.182	1	4	
	4-port	4.85	5	1.185	2	6	
"pliability"(CSS)	3-port	2.05	2	0.931	1	4	
	4-port	4.85	5	0.989	3	6	
"surface area"(CSS)	3-port	2	2	0.941	1	4	
	4-port	4.63	5	1.12	3	7	

The above table represents **Table 14: Comparison of Scar Characteristics Using the Patient And Observer Scar Assessment Scale (POSAS) Between 3-Port and 4-Port Laparoscopic Procedures.** The scar characteristics were assessed based on different parameters, including vascularity, pigmentation, thickness, relief, pliability, and surface area, using the POSAS. A P-value of less than 0.001 suggests a highly significant difference between the two techniques in terms of cosmetic satisfaction. The mean vascularity score was higher in the 4-port group (3.84) compared to the 3-port group (1.94), indicating increased vascularity in the former. Similarly, pigmentation was greater in the 4-port group (4.47) than in the 3-port group (2.55). The mean thickness score was also higher in the 4-port group (4.5) compared to the 3-port group (2.66), suggesting more prominent scars. The relief and pliability scores followed a similar trend, with

higher values in the 4-port group (4.85 and 4.85, respectively) than in the 3-port group (2.56 and 2.05, respectively), indicating greater textural differences in scars. Additionally, the surface area of the scar was larger in the 4-port group (4.63) compared to the 3-port group (2.0). Overall, the findings suggest that scars resulting from 3-port laparoscopic procedures tend to exhibit lesser vascularity, pigmentation, thickness, relief, pliability, and surface area compared to those from 4-port procedures.



DISCUSSION

The present study was conducted to compare the outcomes of three-port versus four-port laparoscopic cholecystectomy, with a focus on various parameters that determine the effectiveness of two techniques. The primary aim of this study was to evaluate the difference in outcomes between 3 port and 4 port methods. The study's specific objectives included assessing the operative time, intra-operative complications, the need for a fourth port, conversion rates (from laparoscopic to open cholecystectomy), postoperative pain scores, postoperative analgesic requirements, and cosmesis. This prospective comparative study was carried out in the Department of General Surgery at Santosh Medical College and Hospital over a period of 1.5 years. The study included patients who were undergoing laparoscopic cholecystectomy for gall stone diseases. The data were collected and analyzed for each patient based on the number of ports used during the surgery (either three or four). By evaluating the outcomes of both techniques, we aimed to determine which approach is more effective, less time-consuming, and associated with fewer complications and better recovery. The study was designed to include a diverse group of patients, and outcomes such as the time taken for surgery, any intraoperative complications like bleeding or organ injury, and the need for conversion to open surgery were carefully recorded. Postoperative recovery was also assessed, including pain scores on a standard pain scale, the

requirement for analgesics, and the cosmetic outcome of the surgical incisions. This study aimed to provide valuable insights into the optimal laparoscopic technique for cholecystectomy in terms of both clinical and patient-reported outcomes.

In our study, we observed a distinct distribution of laparoscopic port usage across different age groups. Among patients aged less than 20 years, all patients (2.4%) used a 3-port technique, while no patients in this age group required a 4-port procedure. In the 21-30 years range, 13.7% of patients underwent surgery using 3 ports, and 8.9% utilized 4 ports. The trend continued in the 31-40 years age group, where 17.7% of patients had a 3-port procedure, and 12.9% had a 4-port procedure. The 41-50 years age group showed a higher preference for the 4-port method, with 16.9% compared to 12.9% for the 3-port technique. Patients aged 51-60 years had a notably lower frequency of both port types, with 3.2% using 3 ports and 11.3% opting for 4 ports. When we analyze laparoscopic port usage by gender, we observe some key differences. In females, 35.5% of patients underwent the procedure with 3 ports, while 33.9% utilized 4 ports. In contrast, males had a lower percentage, with 14.5% using 3 ports and 16.1% opting for 4 ports. This suggests that the choice of port number may be influenced by both age and gender, with females showing a higher frequency of both port types compared to males. Wilkinson TRV et al.[40] aimed to assess the age and gender distribution of patients undergoing procedures using either a 3-port or 4-port technique.

Starting with age distribution, the majority of patients who underwent the 3-port technique were in the 31-40 and 41-50 age groups, accounting for 38.1% each, with a total of 16 patients from these two categories. Notably, no patients were found in the 11-20 years age group for the 3-port technique, and there were no individuals in the 51-60 years age group either. The 4-port technique, however, showed a wider distribution across various age groups. The most significant group was the 41-50 years age group, representing 38.1% of the total sample for the 4-port group. This was followed by the 31-40 years group, which comprised 9.1% of the total. There was also a considerable proportion of patients in the 51-60 years age range, accounting for 23.6%. In terms of overall distribution across both techniques, the total number of patients aged 21-30 years was relatively small, comprising only 14.5% of the study population. The total number of patients across all age groups for the entire study was 76, with the 4-port group consisting of 55 patients, and the 3-port group consisting of 21 patients. In terms of gender distribution, the study demonstrated a slight male predominance across both techniques, with males accounting for 28.57% of the 3-port group and 29.09% of the 4-port group. The remaining percentage, 71.43% in the 3-port group and 70.91% in the 4-port group, was composed of females. Therefore, while there was a higher proportion of females overall, the male-to-female ratio was nearly balanced, and the total gender distribution across both groups was 22 males and 54 females out of 76 patients.

The present study was conducted to further explore the relationship between diabetes status and the number of laparoscopic ports used. Our findings reveal that in patients without diabetes, a significant proportion (48.4%) underwent laparoscopic surgery with 3 ports, while 46.0% had a 4-port procedure. In contrast, patients with diabetes 1.6% underwent 3 ports and 4.0% opting for 4 port surgery. This stark difference in the use of laparoscopic ports between diabetic and non-diabetic patients could suggest that diabetes may influence the surgical approach, possibly due to factors such as altered tissue characteristics, a higher risk of complications, or anatomical considerations that make the use of more ports less desirable in diabetic patients. These results highlight the potential impact of comorbidities like diabetes on surgical decisions, emphasizing the need for tailored approaches in managing such patients during laparoscopic procedures. Therefore, we can conclude that the duration of the procedure was similar in both the 3P and 4P groups, and the slight difference observed is not significant enough to suggest a meaningful disparity between the groups.

When examining the impact of hypertension on the choice of laparoscopic ports, we found that patients without hypertension showed a lesser tendency to undergo the procedure with a 3-port technique (46.8%), with a slightly higher proportion opting for the 4-port method (48.4%). In contrast, patients with hypertension had a significantly lower usage of both port types, with only 3.2% of them undergoing the surgery with 3 ports and 1.6% with 4 ports. This suggests that hypertension

might influence the surgical approach, potentially due to associated comorbidities or clinical considerations that lead to a more cautious and less invasive approach in patients with hypertension. In terms of the impact of previous abdominal surgery on the number of ports used, the findings were also insightful. Among patients with no history of abdominal surgery, 42.7% underwent the procedure with 3 ports, and 44.4% used 4 ports. In contrast, patients with a history of previous surgery (PS) had a slightly lower preference for the 3-port technique, with only 7.3% opting for 3 ports and 5.6% utilizing 4 ports. This trend may reflect the anatomical changes resulting from prior surgical interventions, potentially influencing the decision to use fewer ports for easier maneuverability and minimizing potential complications. We did not find any relevant studies which relates to Distribution of Surgical Ports Based on Hypertension Status and Impact of Previous Abdominal Surgery on the Number of Ports Used in Laparoscopic Procedures.

We analyzed the relationship between gallbladder status, the presence of pericholecystic fluid, the number of gallstones, and the port technique used. In terms of gallbladder status, the majority of patients with well-distended gallbladders (21.0%) underwent the procedure with 3 ports, closely followed by those using 4 ports (19.4%). Interestingly, patients with distended gallbladders showed equal distribution between 3-port and 4-port techniques, each representing 18.5% of the cases. A smaller proportion of patients with partially

distended gallbladders (8.9% for 3-port and 10.5% for 4-port) underwent laparoscopic surgery, while those with distended and edematous gallbladders accounted for the least frequency, with both 3-port and 4-port procedures representing 1.6% of the total cases. Additionally, the presence of pericholecystic fluid was found to influence port choice, with the majority of patients without pericholecystic fluid (46.0% using 3 ports and 47.6% using 4 ports) showing a higher preference for both 3-port and 4-port procedures. In contrast, fewer patients with pericholecystic fluid (4.0% for 3 ports and 2.4% for 4 ports) underwent laparoscopic cholecystectomy, indicating a possible association between pericholecystic fluid presence and surgical approach, though this difference was less pronounced. Furthermore, the number of gallstones also appeared to impact port choice. For patients with multiple gallstones, 37.1% underwent surgery with 3 ports, while 35.5% opted for 4 ports. In comparison, for patients with a single gallstone, 12.9% used 3 ports, and 14.5% used 4 ports. This suggests that patients with multiple gallstones may have a slightly higher tendency for the 3-port configuration, possibly due to the ease of accessing multiple stones with fewer ports. We did not find any relevant studies which relates to Gallbladder Status and number of gall stones with Port Configuration.

The present study was conducted to evaluate and compare the operative times between the 3-port and 4-port laparoscopic techniques. The results showed a significant difference in the operative times between the two methods. For the 3-port technique, the mean operative time was 65 minutes with a median of 63 minutes, and the standard deviation (SD) was 11.72 minutes. The minimum time recorded for a 3-port procedure was 52 minutes, while the maximum was 128 minutes. On the other hand, the 4-port technique had a longer mean operative time of 104 minutes, with a median of 103 minutes and an SD of 9.3 minutes. The operative time for the 4-port technique ranged from 90 minutes to 120 minutes. These findings indicate that the 4-port technique generally requires more time to complete compared to the 3-port technique. The higher mean and median operative times for the 4-port procedure suggest that it may be associated with more complex surgical steps or require additional maneuvers during the surgery. This extended duration could be due to the increased number of ports and the associated need for greater precision and space for maneuvering instruments. Although the 3-port technique is quicker, the choice between these techniques must also consider other factors such as patient anatomy, the nature of the procedure, and surgeon expertise. Krishnanand et al.[41] evaluated the duration of the procedure in two groups, 3P and 4P, and compared the mean times between the two groups. The mean duration for the 3P group was 67 minutes, with a standard deviation of 32.48 minutes, while the mean duration for the 4P group was 68.5 minutes, with a standard deviation of 22.08 minutes. The p-value for

this comparison was 0.8508. This p-value indicates that there was no statistically significant difference between the two groups in terms of the duration of the procedure. A p-value greater than 0.05 suggests that the observed difference in the means could likely be due to random chance rather than a true effect. Therefore, we can conclude that the duration of the procedure was similar in both the 3P and 4P groups, and the slight difference observed is not significant enough to suggest a meaningful disparity between the groups. Kumar M et al.,[44] aimed to compare the outcomes between two groups of patients undergoing laparoscopic procedures using either a 3-port or 4-port approach. The study involved a total of 75 patients, with 36 patients in Group 1 (3 Ports) and 39 patients in Group 2 (4 Ports). One of the key parameters we assessed was the operating time. Group 1, which underwent the 3-port procedure, had an average operating time of 47.3 ± 29.8 minutes, while Group 2, with the 4-port procedure, had an average operating time of 60.8 ± 32.3 minutes. The difference in operating times between the two groups was statistically significant with a p-value of 0.04, suggesting that the 3-port procedure resulted in a shorter operating time compared to the 4-port procedure. This finding is consistent with previous studies that have reported that reducing the number of ports in laparoscopic surgery can potentially decrease operating time due to simpler procedural steps and less dissection required to create additional port sites. However, the trade-off might involve other factors like increased difficulty in certain surgical procedures, which can be addressed with advanced laparoscopic skills.

The present study was conducted to evaluate the intraoperative and postoperative complications associated with the number of ports used in laparoscopic cholecystectomy. The comparison of intraoperative complications revealed that the most common issue was the absence of complications, with 42.7% of 3-port procedures and 46.8% of 4-port procedures showing no complications. Vascular injury at the liver bed occurred in 2.4% of patients undergoing 3-port surgeries, while only 0.8% of 4-port procedures were associated with this complication. Gallbladder perforation with bile spillage occurred in 3.2% of patients with 3-port surgery and 1.6% in 4-port surgeries. A similar trend was seen in gallbladder perforation with stone spillage, where 1.6% of 3-port patients experienced this complication, while none of the 4-port patients did. Vascular injury at the cystic artery was also more common in the 4-port group (0.8%) compared to the 3-port group, where it was not observed. Postoperative complications were similarly analyzed in relation to the number of ports used. A majority of patients, 49.2% in the 3-port group and 50.0% in the 4-port group, had no postoperative complications. The only postoperative complication recorded was surgical site infection, which occurred in 0.8% of the 3-port group, while none of the 4-port patients experienced this issue. We did not find any relevant studies which relates to Comparison of Intraoperative Complications Based on Number of Ports Used in Laparoscopic Cholecystectomy and Comparison of Post-Operative Complications Based on the Number of Ports Used in Surgery.

The present study was conducted to compare postoperative outcomes between 3-port and 4-port laparoscopic procedures, specifically focusing on the requirement for analgesia, hospital stay, and recovery time. Regarding analgesia, patients who underwent 3-port laparoscopic surgery had a mean analgesia requirement of 116.13 mg, with a median of 112.5 mg and a standard deviation of 50.22 mg. The analgesia requirement ranged from a minimum of 75 mg to a maximum of 375 mg. In contrast, patients who underwent the 4-port procedure required significantly more analgesia, with a mean of 262.5 mg, a median of 262.5 mg, and a standard deviation of 37.81 mg. The minimum analgesia requirement for the 4-port group was 225 mg, and the maximum was 300 mg, indicating a more substantial need for pain management in the 4-port group. Regarding the hospital stay, the 3-port laparoscopic procedure had a mean hospital stay of 1.98 days, with a median of 2 days and a standard deviation of 0.91 days, indicating a relatively short recovery period. The range for hospital stay was from 1 day to 6 days. In comparison, the 4-port laparoscopic procedure had a significantly longer hospital stay, with a mean of 4.79 days, a median of 5 days, and a standard deviation of 0.75 days. The hospital stay for the 4-port group ranged from 4 to 6 days, which was considerably longer than the 3-port group. As for the number of days to return to normal activity, the mean recovery time for the 3-port group was 4.73 days, with a median of 5 days and a standard deviation of 0.79 days, with a range from 4 to 7 days. On the other hand, the 4-port group had a mean recovery time of 4.87 days, with a median of 5 days and a standard deviation of 0.82 days,

with a range of 4 to 6 days. Although the recovery times were slightly longer for the 4-port group, the difference was not statistically significant. Kumar P et al.[43] aimed to compare the clinical outcomes between the three-port (Group A) and four-port (Group B) approaches in terms of the duration of hospital stay and the return to normal activity after surgery. The average duration of hospital stay was found to be 37.61 ± 11.42 hours in the three-port group (Group A), with a range from 24 to 72 hours. In contrast, the four-port group (Group B) had a slightly higher average of 38.05 ± 4.93 hours, with a range between 30 and 50 hours. The difference in hospital stay duration between the two groups was statistically insignificant, with a p-value of 0.820. This suggests that the type of surgical approach (three-port vs. four-port) does not have a significant impact on the length of hospital stay. When examining the time taken for patients to return to their normal activities, a notable difference was observed. Group A (three-port) had a mean return time of 5.44 ± 0.50 days, with a range of 5 to 6 days. On the other hand, Group B (four-port) had a longer mean of 5.90 ± 0.82 days, with a range from 4 to 7 days. This difference was statistically significant, with a p-value of 0.003. This indicates that patients in the three-port group tend to return to their normal activities more quickly than those in the four-port group. Singhal P et al.,[45] assessed postoperative analgesia requirements and the duration of hospital stay following laparoscopic cholecystectomy (LC), comparing outcomes between patients undergoing four-port (Group A) and three-port (Group B) techniques. Post-operatively, the requirement for analgesics was similar between the two

groups at 12 hours, with 69.2% of patients in Group A and 63.6% in Group B requiring pain management, indicated by a p-value of 0.38, suggesting no significant difference. However, at 24 hours post-operation, a notable difference emerged. In Group A, 28.8% of patients required analgesics, compared to 17.3% in Group B, with a statistically significant p-value of 0.02. This finding suggests that patients undergoing the three-port technique experienced less pain or managed pain more effectively 24 hours post-surgery. Additionally, the mean duration of hospital stay differed significantly between the groups. Patients in Group A (four-port LC) had an average hospital stay of 1.98 days with a standard deviation of 1.13, whereas Group B (three-port LC) patients had a shorter mean duration of 1.68 days, with a standard deviation of 0.918 (p-value = 0.03). This difference underlines a potentially quicker recovery and earlier discharge readiness in patients undergoing the three-port technique.

In our study, we examined the rates of conversion to open surgery among patients undergoing laparoscopic procedures with either 3-port or 4-port access. The findings indicate that the majority of laparoscopic procedures were successfully completed without the need for conversion to open surgery. Specifically, out of 124 procedures, only 1 (0.8%) required conversion to open surgery when using a 3-port method, while no conversions were observed in the 4-port group. The distribution between the 3-port and 4-port groups was relatively balanced, with 61 procedures (49.2%) utilizing the 3-port method and 62 procedures (50.0%)

utilizing the 4-port method. The very low conversion rate in the 3-port group, coupled with no conversions in the 4-port group, suggests that both methods are highly effective for avoiding the need for open surgery. However, the difference in conversion rates between the two groups was not statistically significant ($p = 0.32$), indicating that the number of ports used may not be a critical factor in the likelihood of requiring conversion to open surgery in these cases. This suggests that other factors, such as the complexity of the procedure or the surgeon's skill and experience, may be more influential in determining whether a conversion to open surgery is necessary. Singhal P et al.,[45] aimed to compare the intraoperative findings and complications between two groups of patients undergoing laparoscopic cholecystectomy (LC), Group A (4-port) and Group B (3-port). The results showed that the incidence of conversion to open procedure was slightly higher in Group A (4-port) with 4 patients (3.8%) requiring conversion compared to 1 patient (0.9%) in Group B (3-port). However, the difference in conversion rates between the two groups was not statistically significant, with a p-value of 0.15, indicating that the type of port used did not substantially affect the likelihood of conversion to open surgery. While the conversion rate was higher in the 4-port group, this finding could be attributed to various factors such as patient anatomy, the surgeon's experience, or intraoperative complications that may have been less frequent in the 3-port group. Although the observed p-value suggests no significant difference between the groups, it is important to note that a larger sample size or additional factors could potentially alter these results.

In our study, we compared the clinical characteristics of patients who underwent procedures with either 3-port or 4-port configurations. The results were analyzed using the Patient and Observer Scar Assessment Score (POSAS) across various factors: vascularity, pigmentation, thickness, relief, pliability, and surface area. Each factor was assessed with mean, median, standard deviation (SD), minimum, and maximum values. For vascularity, the 3-port group had a mean POSAS score of 1.94, while the 4-port group showed a significantly higher mean score of 3.84, with a p-value of less than 0.001, indicating a statistically significant difference. This suggests that the 4-port configuration may promote increased vascularity compared to the 3-port approach. Pigmentation was also notably higher in the 4-port group, with a mean score of 4.47 compared to 2.55 in the 3-port group. The difference in pigmentation between the groups suggests a stronger pigmentation response in the 4-port group, which could be related to the increased trauma or manipulation during the procedure. Thickness scores were similarly elevated in the 4-port group, with a mean of 4.5 compared to 2.66 in the 3-port group. This higher score reflects a thicker tissue response in the 4-port group, potentially indicating greater healing time or increased tissue reaction post-surgery. Relief, as measured by the POSAS, was also significantly higher in the 4-port group, with a mean score of 4.85 compared to 2.56 in the 3-port group. This suggests that patients in the 4-port group reported better relief, which may be attributed to more thorough intervention or better surgical outcomes. For pliability, the 4-port group had a mean score of 4.85, whereas the 3-port group had a lower mean of

2.05. The improved pliability in the 4-port group may be linked to the difference in surgical approach, leading to better tissue flexibility and recovery. Finally, surface area was substantially higher in the 4-port group, with a mean score of 4.63 compared to 2 in the 3-port group. This significant difference might indicate a more extensive surgical area affected by the 4-port approach. We did not find any relevant study which relates to Comparison of Scar Characteristics Using the Patient And Observer Scar Assessment Scale (POSAS) Between 3-Port and 4-Port Laparoscopic Procedures

CONCLUSION

- The 3-port laparoscopic technique was more commonly used in younger age groups, whereas the 4-port technique was preferred in older patients, especially those aged 41-50 and 51-60 years. Gender-wise distribution showed a nearly equal preference for both techniques among female patients, while males had a slightly higher usage of the 4-port approach.
- Non-diabetic & diabetic patients underwent both 3-port and 4-port techniques in nearly equal proportions, impact on port selection was minimal. Among hypertensive patients, the 3-port technique was more frequently used than the 4-port technique. Patients with a history of previous abdominal surgery were slightly more likely to undergo a 3-port laparoscopic procedure, though the 4-port approach was still commonly utilized.
- Gallbladder distension status did not significantly influence the choice of port configuration, as both 3-port and 4-port techniques were used across different gallbladder conditions. The presence of pericholecystic fluid was slightly more common in the 3-port group, although its impact on port selection was minimal. Patients with multiple gallstones had a similar distribution between the 3-port and 4-port techniques, suggesting no strong preference based on stone count.

- The 3-port technique had a significantly shorter mean operative time (65 minutes) compared to the 4-port technique (104 minutes), indicating a time-saving advantage.
- Intraoperative complications were slightly higher in the 3-port group, with more frequent vascular injuries and gallbladder perforations compared to the 4-port group. Postoperative complications were minimal in both groups, with only one case of surgical site infection occurring in the 3-port group.
- The 3-port technique was associated with a significantly lower analgesia requirement and shorter hospital stays compared to the 4-port approach.
- The number of days required to return to normal activity was similar in both techniques, indicating comparable recovery times.
- Conversion to open surgery was rare, with only one case occurring in the 3-port group and none in the 4-port group.
- Cosmetic scar scores were consistently lesser in the 3-port group across all assessed parameters, including vascularity, pigmentation, thickness, relief, pliability, and surface area, indicating a more noticeable scar outcome as compared to 4 port method.

LIMITATIONS

- The sample size of 124 may not be large enough to provide comprehensive generalizability across a broader population.
- The study was conducted at a single medical institution, which may introduce institutional bias and limit the generalizability of findings to other settings.
- Only patients aged 18 to 60 years were included, which excludes a significant portion of the population such as younger or older patients who may also undergo laparoscopic cholecystectomy.
- The study does not account for the variations in the surgeon's experience, which could influence the outcomes of laparoscopic cholecystectomy.
- The analysis may not have fully captured long-term complications or follow-up beyond the immediate postoperative period.
- The statistical methods used may not account for potential confounding factors that could influence the results, such as variations in surgical technique and instrumentation.

SUMMARY

The present study was carried out with the aim of comparing the outcomes of three-port versus four-port laparoscopic cholecystectomy, focusing on several key parameters, such as surgical time, postoperative recovery, complication rates, and cosmetic results. This prospective comparative study was conducted over a period of 1.5 years at Santosh Medical College and Hospital, and it involved a total of 124 patients who underwent laparoscopic cholecystectomy for gallbladder-related diseases. The primary objective was to assess the differences between the two surgical techniques and determine which approach resulted in better patient outcomes, particularly in terms of efficiency, feasibility and recovery time.

The results of the study showed that patients undergoing the three-port laparoscopic procedure experienced significantly shorter operative times compared to those who had the four-port procedure. On average, the three-port surgeries took 65 minutes, while the four-port surgeries took 104 minutes. This difference in operative time is crucial as it indicates that the three-port technique is more time-efficient, which not only reduces the amount of time a patient is under anesthesia but also minimizes potential risks associated with longer surgeries. Additionally, the shorter operative time of the three-port approach is advantageous in terms of overall surgical efficiency, which is particularly beneficial in busy surgical settings.

Another important finding from this study was the reduced requirement for postoperative analgesia in the three-port group. Patients who underwent the three-port laparoscopic cholecystectomy needed significantly less pain medication after the surgery, which suggests a reduced level of postoperative discomfort compared to the four-port group. Furthermore, the length of hospital stay was notably shorter for patients in the three-port group, with an average stay of 1.98 days compared to 4.79 days for the four-port group. The shorter recovery time in the three-port group is a key advantage, as it allows patients to return to their normal activities more quickly, reducing the burden on healthcare resources and improving overall patient satisfaction.

Despite the advantages observed in the three-port group, the study also revealed some differences in the occurrence of intraoperative complications. Although the three-port group showed a slightly higher rate of complications, including vascular injury and gallbladder perforation, the overall complication rates were relatively low for both techniques. The four-port approach appeared to offer a slight advantage in terms of fewer complications, which may be attributed to the added stability and better visualization that can achieved during the surgery. These factors may help reduce the likelihood of errors or accidents, such as unintended injuries to surrounding tissues.

When looking at postoperative complications, including the risk of infection, the study found that there was one case of surgical site infection in the three-port

group, whereas no infections were observed in the four-port group. This suggests that while both techniques are relatively safe, the four-port method may provide slightly better control in terms of reducing the risk of infection. However, the difference was small, and overall, both approaches were found to be safe with minimal postoperative complications.

One of the most important aspects of the study was the evaluation of cosmetic outcomes, which was measured using the Patient and Observer Scar Assessment Scale (POSAS). This scale assesses several factors that contribute to the appearance and quality of the surgical scar, such as vascularity, pigmentation, thickness, relief, pliability, and surface area. The results indicated that the four-port laparoscopic technique generally resulted in more noticeable scars, with higher scores for vascularity, pigmentation, thickness, and surface area. In contrast, the three-port technique was associated with smaller, less visible scars, which could be a significant benefit for patients who are concerned about the cosmetic appearance of their postoperative scars.

In addition to evaluating the direct outcomes of the surgeries, the study also considered other patient factors, such as the presence of diabetes and hypertension, which could influence the choice of surgical technique. The data revealed that most patients without these conditions underwent the three-port procedure, while those with diabetes or hypertension were more likely to have the four-port approach. This might be due to the additional complexity and

potential for complications in patients with these conditions, which might make the four-port method a safer and more reliable option for achieving optimal results, still more number of patient should be enrolled in study with co morbidities to generate better outomes.

The study also examined the impact of previous abdominal surgery on the choice of port configuration. The data suggested that patients with a history of previous abdominal surgeries tended to undergo the four-port technique slightly more often than those without such a history. This could be due to the need for more careful dissection and better visibility in patients with existing adhesions or altered anatomy, which the additional port may help provide.

In terms of gallbladder status, the study analyzed how different types of gallbladder conditions, such as distended or edematous gallbladders, influenced the choice of port configuration. The findings indicated that both the three-port and four-port techniques were used across a variety of gallbladder conditions, with no significant preference for one technique over the other based on gallbladder status. This suggests that both approaches are adaptable and can be effectively used regardless of the specific condition of the gallbladder.

The study also looked at the role of pericholecystic fluid in influencing the choice of laparoscopic technique. Pericholecystic fluid, which can be an indicator of underlying inflammation or infection, was more commonly seen in patients

undergoing the four-port procedure. However, the difference was minimal, indicating that both techniques can be performed safely in patients with this condition.

In conclusion, the present study provides valuable insights into the comparative outcomes of three-port versus four-port laparoscopic cholecystectomy. The three-port technique was associated with shorter operative times, reduced analgesic requirements, and better cosmetic outcomes. Although the four-port technique showed slightly fewer intraoperative and postoperative complications, the differences were small and did not significantly impact the overall safety and effectiveness of the procedure. The choice between these two techniques should therefore be based on individual patient factors, surgeon preference, and the specific clinical scenario. Ultimately, both techniques are effective, safe, and offer distinct advantages depending on the patient's needs and the desired surgical outcomes.

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PROFORMA

Serial No.:
Date:
Name: Age/Sex:
IPD no.: Occupation:
Address:
Diagnosis:
Treatment Plan:
Date of surgery:
How many ports used for surgery?
If converted to open procedure.

HISTORY

Chief complaints:
History of presenting illness:
Past history:
Family history:
Personal history:
Menstrual history (in females):
Co morbidities:

EXAMINATION

General physical examination

Height(m): Weight (Kg): BMI(Kg/m_2):

Pallor: Icterus: Cyanosis: Clubbing: Lymphadenopathy: Edema:

Systemic examination

· CVS:

· RS:

· P/A:

· CNS:

Local Examination:

INVESTIGATIONS:

Haemoglobin(gm%): Blood sugar(mg/dl): RBS:

Viral Markers: FBS: PPBS: LFT:

Serum Urea(mg/dl): Serum Creatinine(mg/dl):

Urine (R/M):

USG Abdomen:

OPERATION DETAILS:

Duration:

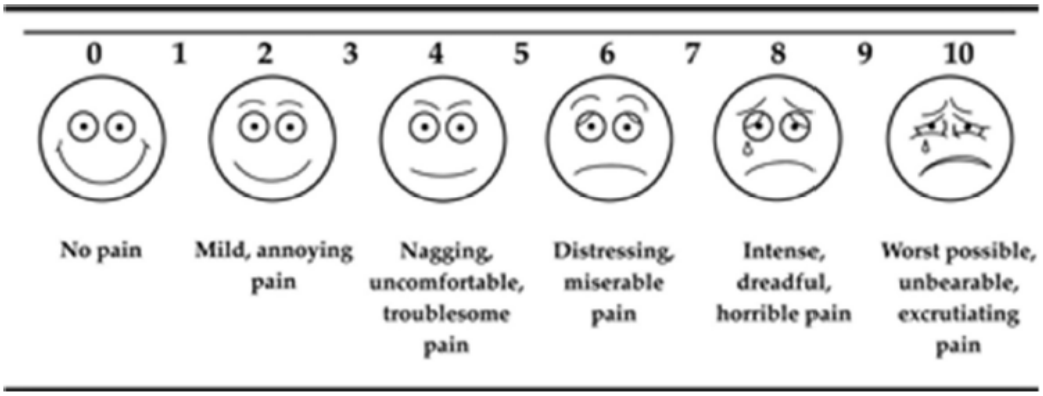
Ports:

Findings:

DAY OF DISCHARGE:

Duration of postoperative pain

VISUAL ANALOGUE SCALE

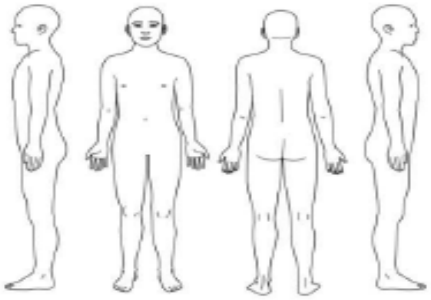


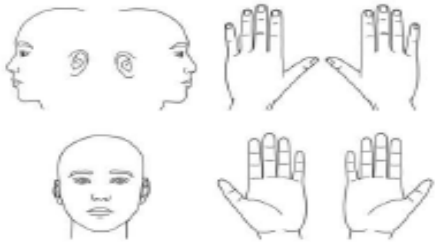
PATIENT AND OBSERVER SCAR ASSESSMENT SCALE

POSAS Observer scale

The Patient and Observer Scar Assessment Scale v2.0 / EN

Date of examination:	**Name of patient:**
Observer:	
Location:	**Date of birth:**
Research / study:	**Identification number:**





	1 = normal skin								worst scar imaginable = 10	
PARAMETER	1	2	3	4	5	6	7	8	9	10
VASCULARITY	○	○	○	○	○	○	○	○	○	○
PIGMENTATION	○	○	○	○	○	○	○	○	○	○
THICKNESS	○	○	○	○	○	○	○	○	○	○
RELIEF	○	○	○	○	○	○	○	○	○	○
PLIABILITY	○	○	○	○	○	○	○	○	○	○
SURFACE AREA	○	○	○	○	○	○	○	○	○	○
OVERALL OPINION	○	○	○	○	○	○	○	○	○	○

CATEGORY
PALE | PINK | RED | PURPLE | MIX
HYPO | HYPER | MIX
THICKER | THINNER
MORE | LESS | MIX
SUPPLE | STIFF | MIX
EXPANSION | CONTRACTION | MIX

Explanation

The observer scale of the POSAS consists of six items (vascularity, pigmentation, thickness, relief, pliability and surface area).
All items are scored on a scale ranging from 1 ('like normal skin') to 10 ('worst scar imaginable').
The sum of the six items results in a total score of the POSAS observer scale. Categories/boxes are added for each item. Furthermore, an overall opinion is scored on a scale ranging from 1 to 10.
All parameters should preferably be compared to normal skin on a comparable anatomic location.

Explanatory notes on the items:

- **VASCULARITY** Presence of vessels in scar tissue assessed by the amount of redness, tested by the amount of blood return after blanching with a piece of Plexiglas
- **PIGMENTATION** Brownish coloration of the scar by pigment (melanin); apply Plexiglas to the skin with moderate pressure to eliminate the effect of vascularity
- **THICKNESS** Average distance between the subcutical-dermal border and the epidermal surface of the scar
- **RELIEF** The extent to which surface irregularities are present (preferably compared with adjacent normal skin)
- **PLIABILITY** Suppleness of the scar tested by wrinkling the scar between the thumb and index finger
- **SURFACE AREA** Surface area of the scar in relation to the original wound area

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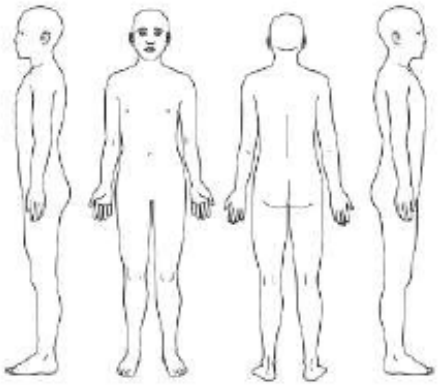
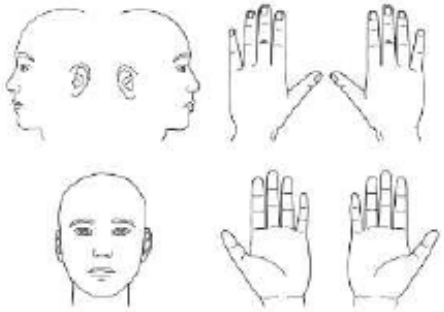
POSAS Patient scale

The Patient and Observer Scar Assessment Scale v2.0 / EN

Date of examination:	**Name of patient:**
Observer:	
Location:	**Date of birth:**
Research / study:	**Identification number:**





	1 = no, not at all	yes, very much = 10
HAS THE SCAR BEEN PAINFUL THE PAST FEW WEEKS?	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
HAS THE SCAR BEEN ITCHING THE PAST FEW WEEKS?	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	

	1 = no, as normal skin	yes, very different = 10
IS THE SCAR COLOR DIFFERENT FROM THE COLOR OF YOUR NORMAL SKIN AT PRESENT?	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
IS THE STIFFNESS OF THE SCAR DIFFERENT FROM YOUR NORMAL SKIN AT PRESENT?	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
IS THE THICKNESS OF THE SCAR DIFFERENT FROM YOUR NORMAL SKIN AT PRESENT?	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
IS THE SCAR MORE IRREGULAR THAN YOUR NORMAL SKIN AT PRESENT?	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	

	1 = as normal skin	very different = 10
WHAT IS YOUR OVERALL OPINION OF THE SCAR COMPARED TO NORMAL SKIN?	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	

[illegible]

MASTER CHART OUTLINE

1.IP number

2.Name

3.Age

4.Gender

5.Sex

6.Number of ports used in surgery 3port or 4 port

7.Operative time in min

8.Intra Operative Complication

9.Post-Operative pain score on VAS (1-10)

10.Analgesic injection requirement

11.Need for fourth port

12.Conversion Rate to Open Surgery

13.Hospital Stay

14.Analgesic tablet requirement

15.Number of days to return to normal activity(mean)

16.Cosmesis satisfaction score

SANTOSH MEDICAL COLLEGE AND HOSPITAL (GHAZIABAD)

INFORMED CONSENT

I _____ Son/Daughter/Wife of _____ resident of _____hereby declare that I give my full, free and voluntary informed consent in the thesis - "**Three Port Versus Four Port Laparoscopic Cholecystectomy: A Prospective Comparative Clinical Study** " Dr._____ has informed me to my full satisfaction, in the language I understand, about the purpose, nature of study and various laboratory investigations for the study to be carried out. I have been informed about the duration of the study and instructions to be followed during the study period.

I give full consent for being enrolled in the above study and I reserve my rights to withdraw from this study, whenever I wish without prejudice of my right to undergo further treatment at Santosh Hospital, Ghaziabad U.P.

Patient's/ Patient's relative's signature Doctors signature
Or thumb impression

Name: Date:

We have witnessed that the patient signed the above form in the presence of his free will after fully understanding its content.

Signature of Witness Signature of Investigator

Name: Dr. Jash Divyeshbhai Jagani

Name Designation: PG Department of General Surgery

Contact No.- 9558667550

संतोष मेडिकल कॉलेज एवं अस्पताल (गाजियाबाद)
सहमति पत्र (सूचित)

मैं _____ बेटा/ बेटी/ पत्नी_____निवासी _____ घोषणा करता हूं कि डॉ ._____, ने मुझे मेरी भाषा में अपने अध्ययन "**Three Port Versus Four Port Laparoscopic Cholecystectomy: A Prospective Comparative Clinical Study**" के उद्देश्य के बारे में, और अध्ययन के दौरान अपनाई जाने वाली विभिन्न प्रयोगशाला जांच के बारे में सूचित कर दिया है। मुझे अध्ययनकी अवधि और उसके दौरान अपनाए जाने वाले निर्देश भी मेरी भाषा मे समझा दिए गए हैं| मैं उपरोक्त अध्ययन में बिना किसी दबाव के दाखिला ले रहा हूं और पूर्ण सहमति दे रहा हूं | सन्तोष अस्पताल, गाजियाबाद में अपने आगे के उपचार पर बिना प्रतिकूल प्रभाव डाले इस अध्ययन से और प्रयोगशाला जांच की प्रकृति से मैं जब चाहूँ बाहर जाने के अपने अधिकार को सुरक्षित रख रहा हूं |

रोगी / रोगी के रिश्तेदार के हस्ताक्षर डॉक्टर के हस्ताक्षर
नाम
दिनांक:
मेरी उपस्थिति में मरीज ने पूरी तरह से डाकटर के बताए गए अध्ययन और निर्देशों को समझने के बादअपनी स्वतंत्र इच्छा से ऊपर के फार्म पर हस्ताक्षर किए हैं ।

हस्ताक्षरनाम: डॉ.जश जगानी

पदनाम: पीजी
शल्य चिकित्सा विभाग
संपर्क नंबर- 9558667550